

# AN48840B

Low current consumption, high sensitivity CMOS Hall IC  
 Alternating magnetic field operation  
 (For low-speed rotation detection)

## Overview

The AN48840B is a Hall ICs (a magnetic sensor) which has 2 times or more sensitivity and a low current consumption of about one fiftieth 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.

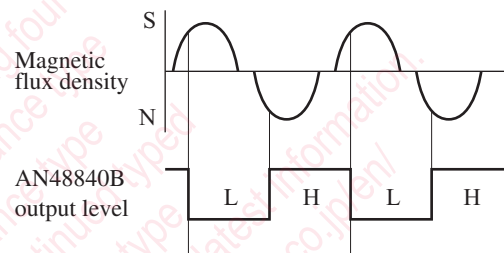
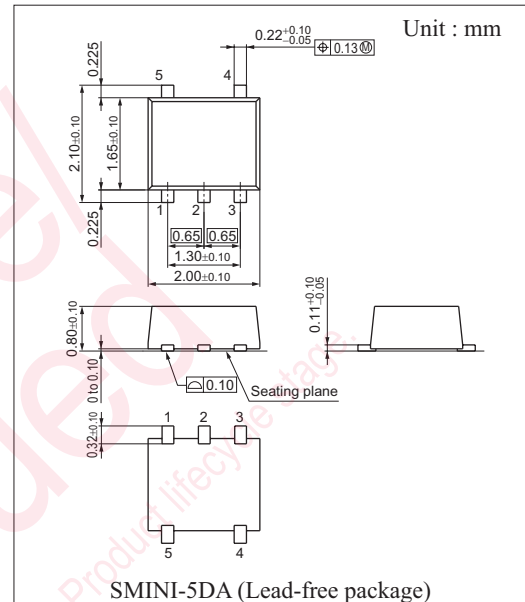
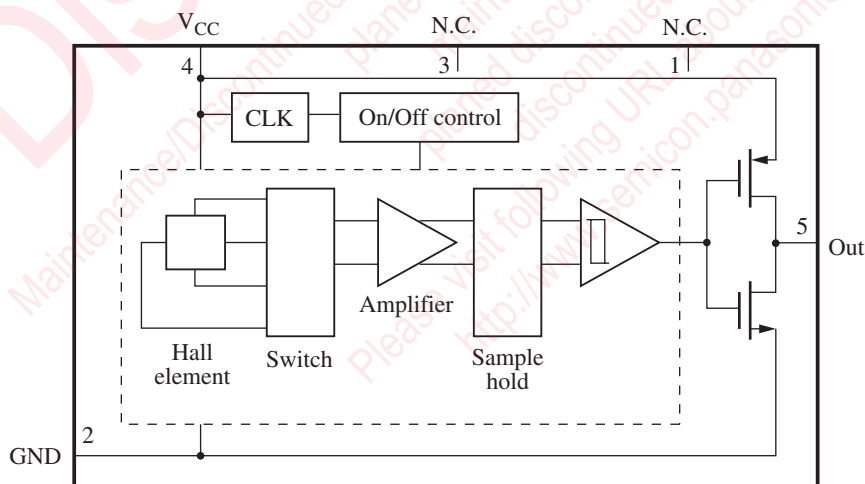
## Features

- High sensitivity due to offset cancel circuit and a new sample and hold circuit
- Small current by using intermittent action  
 (Average supply current: 56  $\mu$ A typ., Sampling period: 670  $\mu$ s typ.)
- Small package (SMD)
- CMOS inverter output (logic output form)

## Applications

- Functional operation key, Mouse,  
 Appliances for low-speed rotation detection

## Block Diagram



## Pin Descriptions

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	N.C.	—	4	V <sub>CC</sub>	Power supply
2	GND	Ground	5	Out	Output
3	N.C.	—			

### ■ 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  $T_a = 25^\circ\text{C}$ .

\*2:  $T_a = 75^\circ\text{C}$ . For the independent IC without a heat sink. Please use within the range of power dissipation, referring to  $P_D - T_a$  curve.

### ■ Recommended Operating Range

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

### ■ Electrical Characteristics $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating magnetic flux density 1 *1	$B_{HL}$	$V_{CC} = 3\text{ V}, V_{CC} = 2.5\text{ V}$	0.5	—	6	mT
Operating magnetic flux density 2 *2	$B_{LH}$	$V_{CC} = 3\text{ V}, V_{CC} = 2.5\text{ V}$	-6	—	-0.5	mT
Output voltage 1	$V_{OL1}$	$V_{CC} = 3\text{ V}, I_O = 2\text{ mA}, B = 6.0\text{ mT}$	—	0.1	0.3	V
Output voltage 1	$V_{OL2}$	$V_{CC} = 2.5\text{ V}, I_O = 2\text{ mA}, B = 6.0\text{ mT}$	—	0.1	0.3	V
Output voltage 2	$V_{OH1}$	$V_{CC} = 3\text{ V}, I_O = -2\text{ mA}, B = -6.0\text{ mT}$	2.7	2.9	—	V
Output voltage 2	$V_{OH2}$	$V_{CC} = 2.5\text{ V}, I_O = -2\text{ mA}, B = -6.0\text{ mT}$	2.7	2.9	—	V
Supply current 1 *3	$I_{CCAVE}$	$V_{CC} = 3\text{ V}$	—	56.0	85.0	$\mu\text{A}$
Supply current 2 *3	$I_{CC2AVE}$	$V_{CC} = 2.5\text{ V}$	—	48.0	72.0	$\mu\text{A}$
Intermittent action time	$T_{sam}$	$V_{CC} = 3\text{ V}$	490	670	850	$\mu\text{S}$
Intermittent action time 2	$T_{sam2}$	$V_{CC} = 2.5\text{ V}$	513	710	890	$\mu\text{S}$

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	BW	$V_{CC} = 3\text{ V}$	—	7	—	mT
Supply current 3	$I_{CCON}$	$V_{CC} = 3\text{ V}$	—	1.4	2.1	mA
Supply current 4	$I_{CCOFF}$	$V_{CC} = 3\text{ V}$	—	2.5	—	$\mu\text{A}$
Supply current 5	$I_{CC2ON}$	$V_{CC} = 2.5\text{ V}$	—	1.12	1.68	mA
Supply current 6	$I_{CC2OFF}$	$V_{CC} = 2.5\text{ V}$	—	2.2	—	$\mu\text{A}$
Operating time	$t_{ON}$	$T_a = -25^\circ\text{C}$ to $75^\circ\text{C}$ , $V_{CC} = 3\text{ V}$	10	26	42	$\mu\text{S}$
Stop time	$t_{OFF}$	$T_a = -25^\circ\text{C}$ to $75^\circ\text{C}$ , $V_{CC} = 3\text{ V}$	258	644	1 030	$\mu\text{S}$
Operating time 2	$t_{2ON}$	$T_a = -25^\circ\text{C}$ to $75^\circ\text{C}$ , $V_{CC} = 2.5\text{ V}$	11	27	43	$\mu\text{S}$
Stop time 2	$t_{2OFF}$	$T_a = -25^\circ\text{C}$ to $75^\circ\text{C}$ , $V_{CC} = 2.5\text{ V}$	270	674	1 078	$\mu\text{S}$

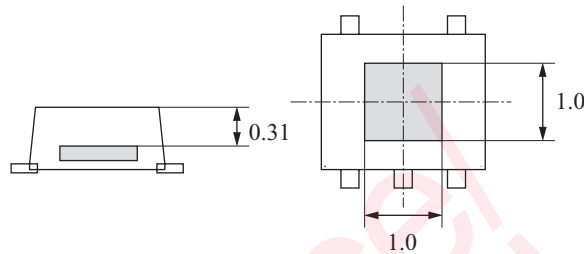
Note) It will operate normally in approximately 0.67 ms after power on.

■ Technical Data

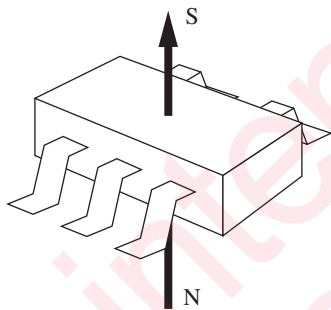
- Position of a Hall element (unit in mm)

Distance from a package surface to sensor part: 0.31 mm (reference value)

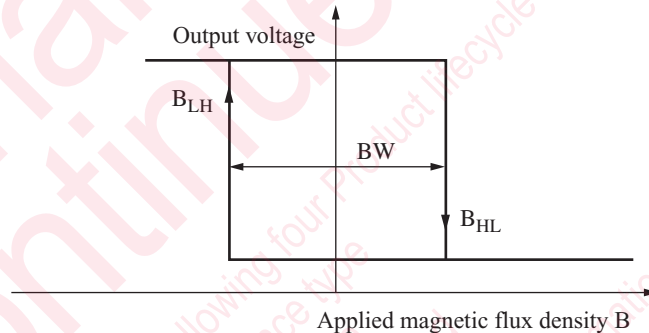
A Hall element is placed on the shaded part in the figure.



- Magneto-electro conversion characteristics

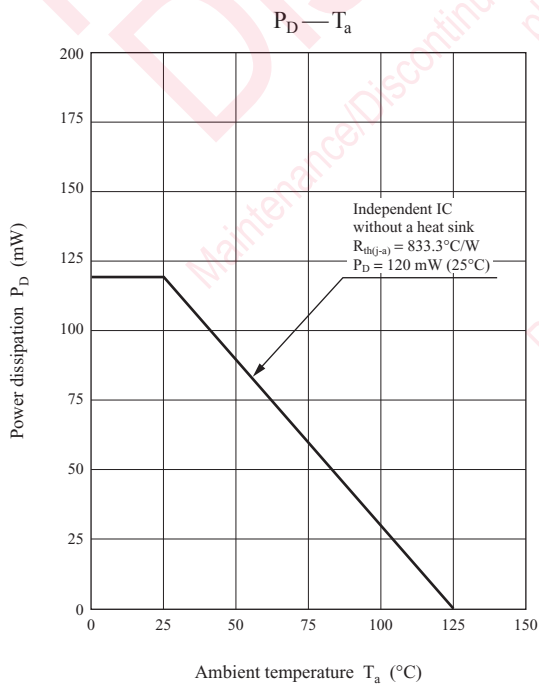


Direction of applied magnetic field



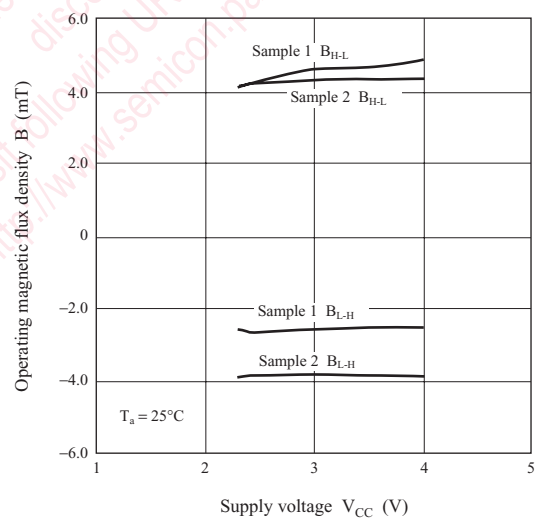
Operating magnetic flux density

- Power dissipation of package SMINI-5DA



- AN48840B Main characteristics

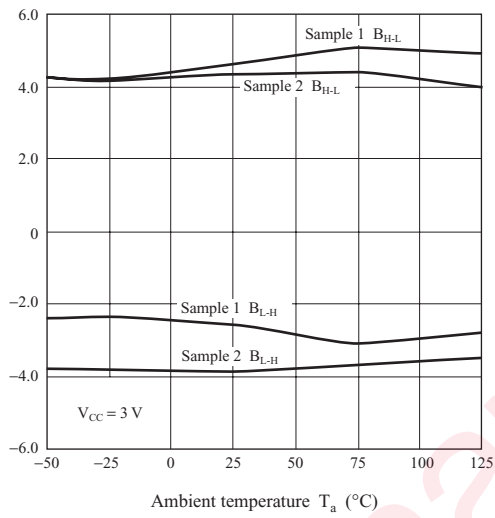
Operating magnetic flux density — Supply voltage



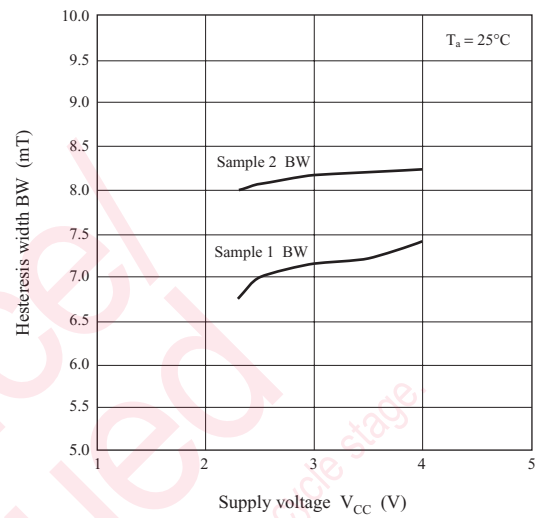
■ Technical Data (continued)

• AN48840B Main characteristics (continued)

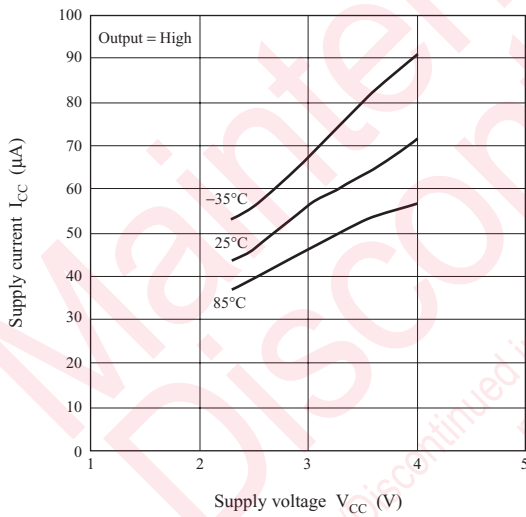
Operating magnetic flux density — Ambient temperature



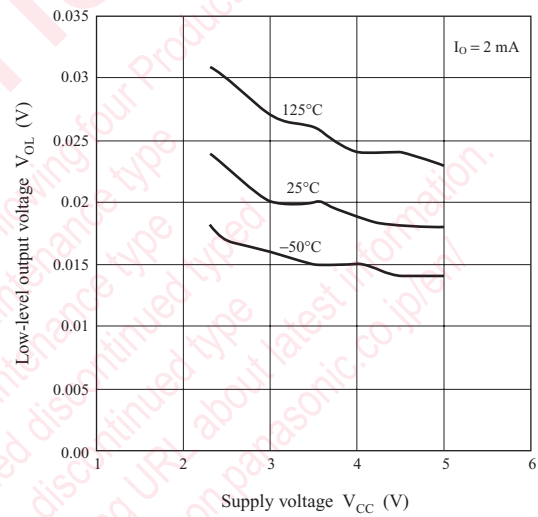
Hysteresis width — Supply voltage



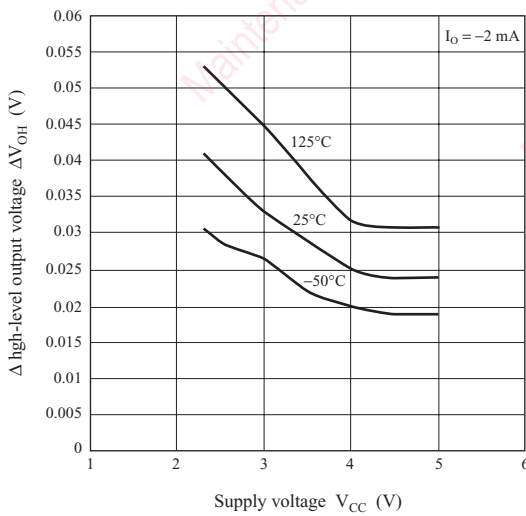
Supply current — Supply voltage



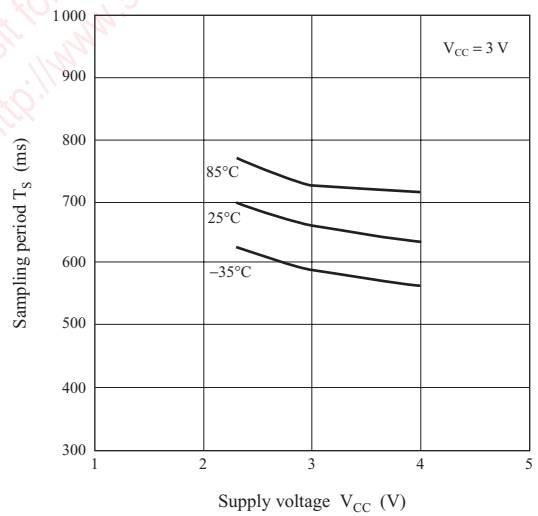
Low-level output voltage — Supply voltage



$\Delta$  high-level output voltage — Supply voltage



Sampling period — Supply voltage



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