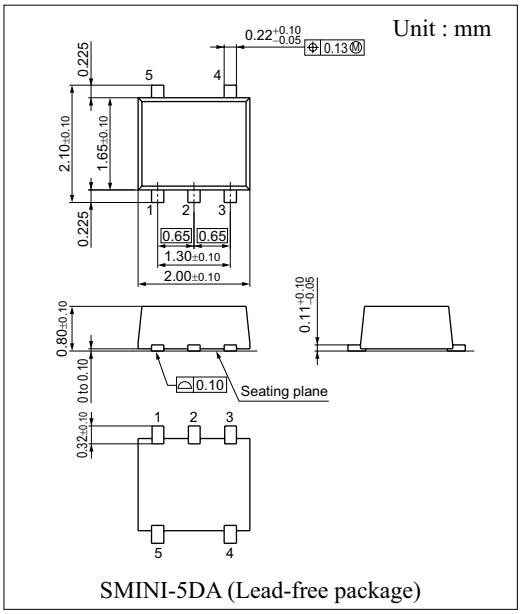
AN48840B

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



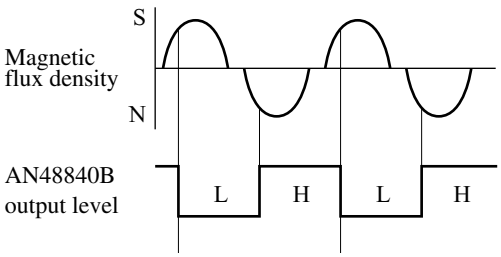
■ Overview

The AN48840B is a Hall IC (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

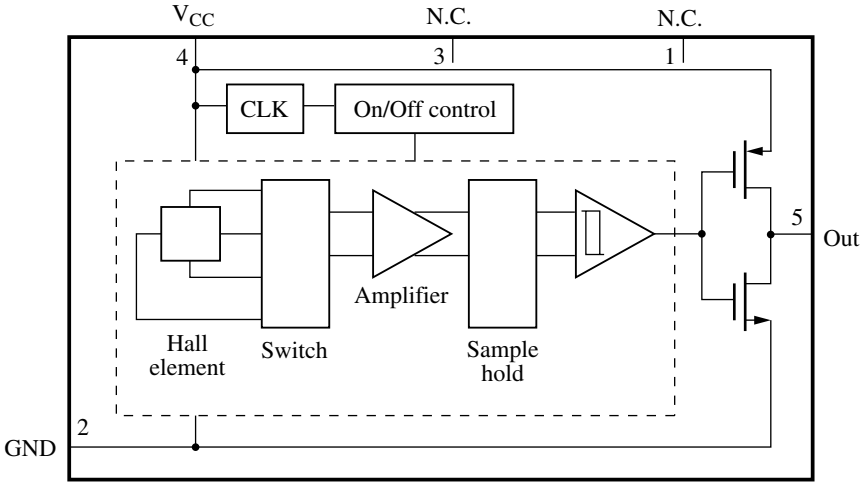
- High sensitivity (6 mT max.) due to offset cancel circuit and a new sample and hold circuit
- Small current by using intermittent action
  (Average supply current: 56 μA typ., Sampling period: 670 μs typ.)
- Small package (SMD)
- CMOS inverter output (logic output form)



■ 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_{CC}	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°C.
∗2: T_a = 75°C. For the independent IC without a heat sink. Please use within the range of power dissipation, refering 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°C ± 2°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating magnetic flux density 1 *1	B_{HL}	V_{CC} = 3 V, V_{CC} = 2.5 V	0.5	—	6	mT
Operating magnetic flux density 2 *2	B_{LH}	V_{CC} = 3 V, V_{CC} = 2.5 V	–6	—	– 0.5	mT
Output voltage 1	V_{OL1}	V_{CC} = 3 V, I_O = 2 mA, B = 6.0 mT	—	0.1	0.3	V
Output voltage 1	V_{OL2}	V_{CC} = 2.5 V, I_O = 2 mA, B = 6.0 mT	—	0.1	0.3	V
Output voltage 2	V_{OH1}	V_{CC} = 3 V, I_O = –2 mA, B = –6.0 mT	2.7	2.9	—	V
Output voltage 2	V_{OH2}	V_{CC} = 2.5 V, I_O = –2 mA, B = –6.0 mT	2.7	2.9	—	V
Supply current 1 *3	$I_{CC_{AVE}}$	V_{CC} = 3 V	—	56.0	85.0	µA
Supply current 2 *3	$I_{CC2_{AVE}}$	V_{CC} = 2.5 V	—	48.0	72.0	µA
Intermittent action time	Tsam	V_{CC} = 3 V	490	670	850	µS
Intermittent action time 2	Tsam2	V_{CC} = 2.5 V	513	710	890	µS

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

• Design reference data

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Hysteresis width	BW	V_{CC} = 3 V	—	7	—	mT
Supply current 3	$I_{CC_{ON}}$	V_{CC} = 3 V	—	1.4	2.1	mA
Supply current 4	$I_{CC_{OFF}}$	V_{CC} = 3 V	—	2.5	—	µA
Supply current 5	$I_{CC2_{ON}}$	V_{CC} = 2.5 V	—	1.12	1.68	mA
Supply current 6	$I_{CC2_{OFF}}$	V_{CC} = 2.5 V	—	2.2	—	µA
Operating time	t_{ON}	T_a = –25°C to 75°C, V_{CC} = 3 V	10	26	42	µS
Stop time	t_{OFF}	T_a = –25°C to 75°C, V_{CC} = 3 V	258	644	1 030	µS
Operating time 2	$t_{2_{ON}}$	T_a = –25°C to 75°C, V_{CC} = 2.5 V	11	27	43	µS
Stop time 2	$t_{2_{OFF}}$	T_a = –25°C to 75°C, V_{CC} = 2.5 V	270	674	1 078	µS

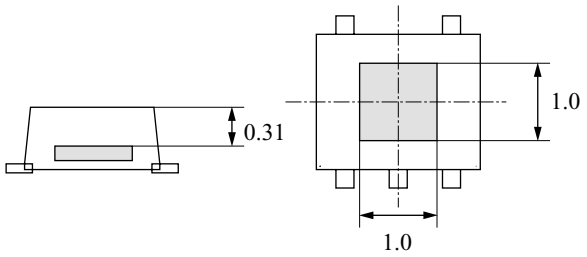
Note) It will operate normally in approximately 0.67 ms after power on.

■ Technical Data

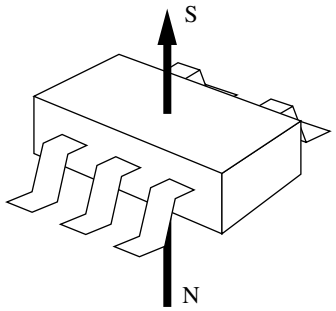
- Position of a Hall element (unit in mm)

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

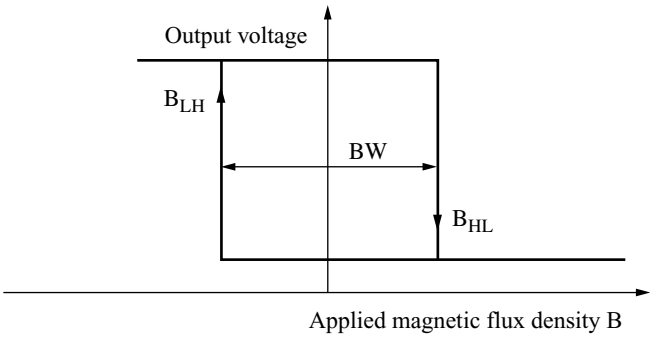
  A Hall element is placed on the shaded part in the figure.



- Magneto-electro conversion characteristics



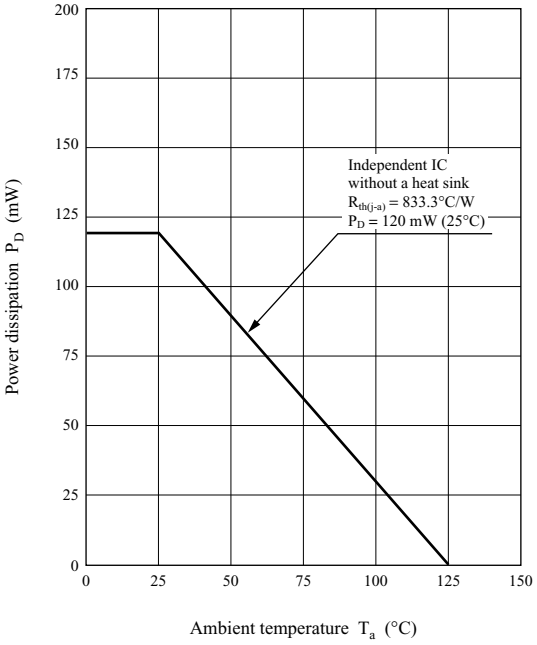
Direction of applied magnetic field



Operating magnetic flux density

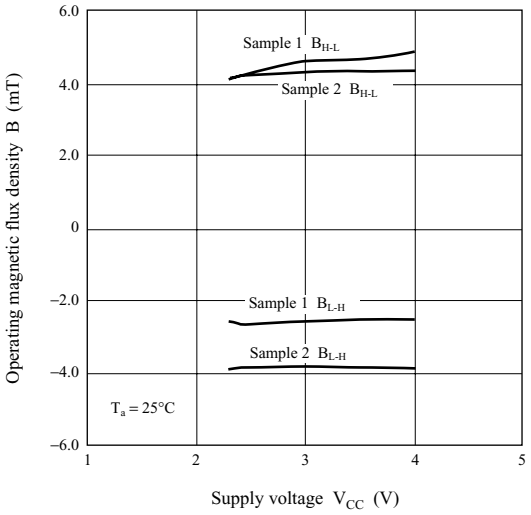
- Power dissipation of package SMINI-5DA

P_D — T_a



- Main characterisitcs

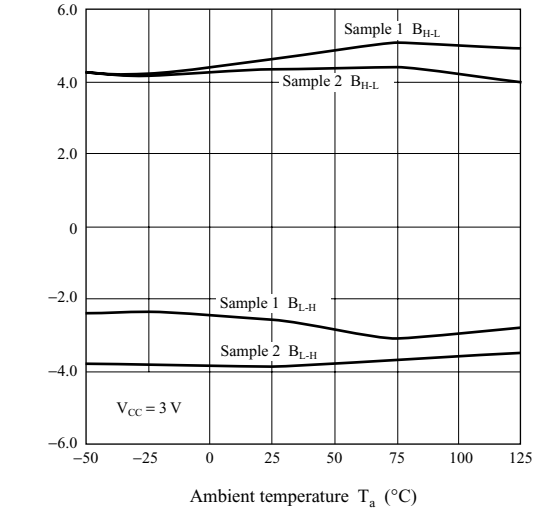
Operating magnetic flux density — Supply voltage



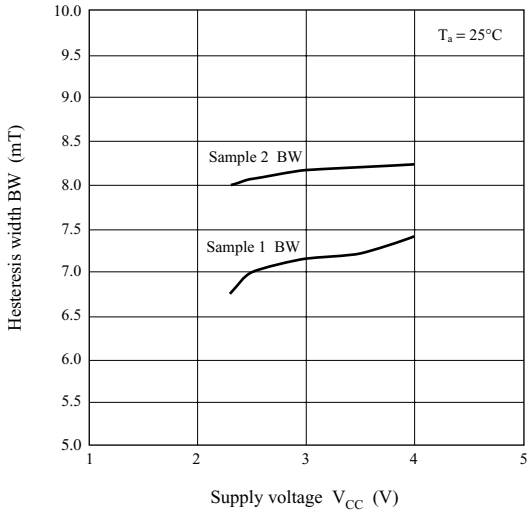
■ Technical Data (continued)

- Main characterisitcs (continued)

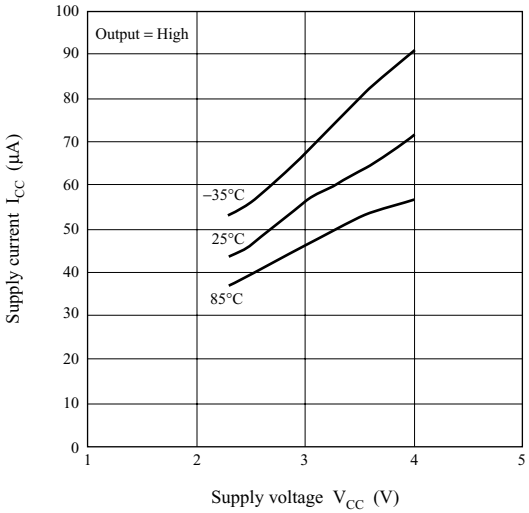
Operating magnetic flux density — Ambient temperature



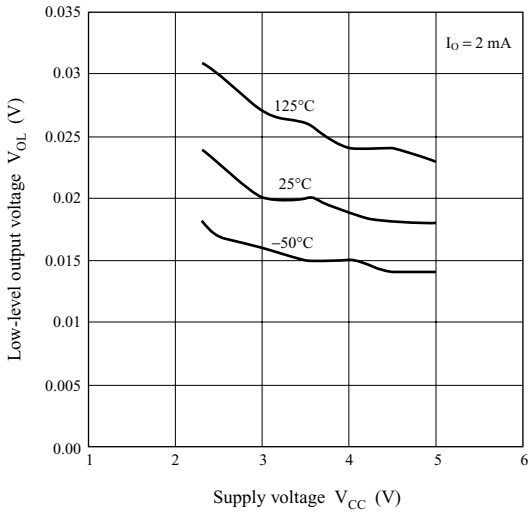
Hysteresis width — Supply voltage



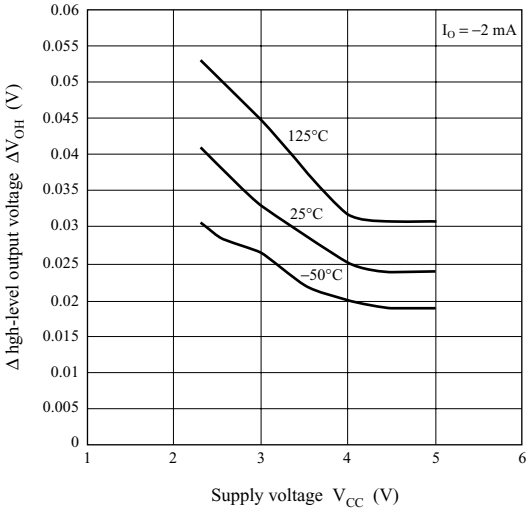
Supply current — Supply voltage



Low-level output voltage — Supply voltage



Δ high-level output voltage — Supply voltage



Sampling period — Supply voltage