Product Standards

Part No.	AN48841B
Package Code No.	SMINI-5DA

Analogue LSI Business Unit
Semiconductor Company
Matsushita Electric Industrial Co., Ltd.

Established by	Applied by	Checked by	Prepared by
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Established	Revised	

Contents

AN48841B

Low current consumption, high sensitivity CMOS Hall IC
Operates on Alternating Magnetic Field (low-speed rotation for lock detection)

■ Overview

AN48841B is a Hall IC (a magnetic sensor) which has 2 times or more sensitivity and a low current consumption of about one fifties 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 (8mT 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 cycle : 670 µs typ.)
¶ Small package. (SMD)
¶ CMOS inverter output. (no pull-up resistance)

■ Applications

¶ Magneto-electric Conversion Switch.

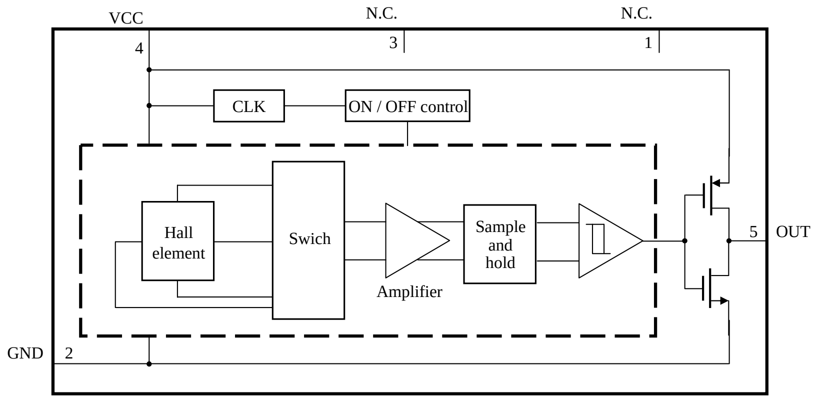
■ Package

¶ 5 pin Plastic Small Surface Mount Package (SMINI Type).

■ Type

¶ Bi-CMOS IC.

■ Block Diagram



■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	N.C.	—	N.C.
2	GND	Ground	Ground pin
3	N.C	—	N.C.
4	VCC	Power supply	Supply pin
5	OUT	Output	Output pin

■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Notes
1	Supply voltage	V_{CC}	5.4	V	*1
2	Supply current	I_{CC}	5	mA	—
3	Power dissipation	P_D	60	mW	*2
4	Operating ambient temperature	T_{opr}	−25 to +75	°C	*3
5	Storage temperature	T_{stg}	−55 to +125	°C	*3

Notes) *1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

*2: The power dissipation shown is the value at T_a = 75°C for the independent (unmounted) IC package without a heat sink.
When using this IC, refer to the P_D-T_a diagram of the package standard page 4 and use under the condition not exceeding the allowable value.

*3: Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for T_a = 25°C.

■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Notes
Supply voltage range	V_{CC}	2.5 to 5.25	V	*

Note) *: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

■ Allowable Voltage Range

Pin No.	Pin name	Range	Unit	Note
2	GND	0	V	*
4	VCC	0 to 5.4	V	*
5	OUT	– 0.3 to (VCC+0.3)	V	*

Note) *: The ranges on the list are the voltages of respective pins in relation to GND.
(VCC+0.3) V ≤ 5.4 V.

■ Electrical Characteristics

Note) T_a = 25°C±2°C unless otherwise specified.

B No.	Parameter	Symbol	Test circuits	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
1	Operating magnetic flux density (1)	BHL	1	V_{CC} = 3 V, 5 V	0.5	—	8	mT	*1
2	Operating magnetic flux density (2)	BLH	1	V_{CC} = 3 V, 5 V	–8	—	– 0.5	mT	*1
3	Output voltage Low(1)	V_{OL1}	2	V_{CC} = 3 V, I_O = 2 mA B = 8.0 mT	—	0.1	0.3	V	
4	Output voltage Low(2)	V_{OL2}	2	V_{CC} = 5 V, I_O = 2 mA B = 8.0 mT	—	0.1	0.3	V	
5	Output voltage High(1)	V_{OH1}	3	V_{CC} = 3 V, I_O = –2 mA B = –8.0 mT	2.7	2.9	—	V	
6	Output voltage High(2)	V_{OH2}	3	V_{CC} = 5 V, I_O = –2 mA B = –8.0 mT	4.7	4.9	—	V	
7	Supply current (1)	I_{CC} (AVE)	4	V_{CC} = 3 V	—	56.0	70.0	μA	*2
8	Supply current (2)	I_{CC2} (AVE)	4	V_{CC} = 5 V	—	100	300	μA	*2
9	Intermittent operation time (1)	Tsam	5	V_{CC} = 3 V	490	670	850	μs	
10	Intermittent operation time (2)	Tsam2	5	V_{CC} = 5 V	456	623	790	μs	

Notes) *1: Symbol BHL shows the operating magnetic flux density at which output level is changed from high to low, and Symbol BLH shows the operating magnetic flux density at which output level is changed from low to high.

*2: $I_{CC}(AVE) = \{I_{CC}(ON) \times t(ON) + I_{CC}(OFF) \times t(OFF)\} / \{t(ON) + t(OFF)\}$.

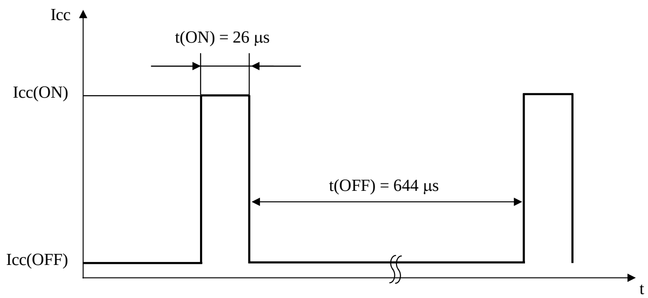
■ Electrical Characteristics (Reference values for design)

Note) T_a = 25°C±2°C unless otherwise specified.

B No.	Parameter	Symbol	Test circuits	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
11	Hysteresis width	BW	1	V_{CC} = 3 V, 5 V	—	7	—	mT	*3
12	Supply current ON(1)	I_{CC} (ON)	4	V_{CC} = 3 V	—	1.4	2.1	mA	*3, 4
13	Supply current OFF(1)	I_{CC} (OFF)	4	V_{CC} = 3 V	—	2.5	—	μA	*3, 4
14	Supply current ON(2)	I_{CC2} (ON)	4	V_{CC} = 5 V	—	2.4	3.5	mA	*3, 4
15	Supply current OFF(2)	I_{CC2} (OFF)	4	V_{CC} = 5 V	—	3.7	—	μA	*3, 4
16	Operation time	t (ON)	—	Ta = -25°C to 75°C, V_{CC} = 3 V	10	26	42	μs	*3, 4
17	Stop time	t (OFF)	—	Ta = -25°C to 75°C, V_{CC} = 3 V	258	644	1 030	μs	*3, 4
18	Operation time 2	t2 (ON)	—	Ta = -25°C to 75°C, V_{CC} = 5 V	9	23	37	μs	*3, 4
19	Stop time 1	t2 (OFF)	—	Ta = -25°C to 75°C, V_{CC} = 5 V	329	600	939	μs	*3, 4

Note) *3: The above characteristics are reference values for design of the IC and are not guaranteed by inspection.
If a problem does occur related to these characteristics, Matsushita will respond in good faith to user concerns.

*4: Power Supply Timing Chart
Normal operation starts approx. 670 μs after power supply is turned on.

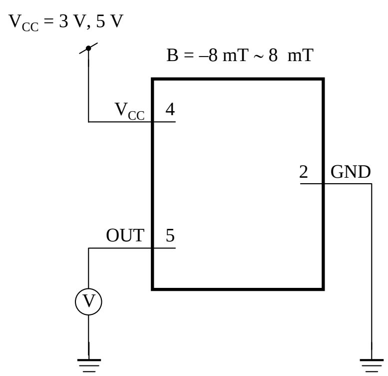


■ Test Circuit Diagram

1. Test Circuit 1 BHL, BLH

Change the applied magnetic flux density and measure the magnetic flux density when the output level changes to Low from High, or to High from Low.

Note) Operating flux density "BHL", "BLH" and Hysteresis width, "BW" are defined as shown in Figure 2



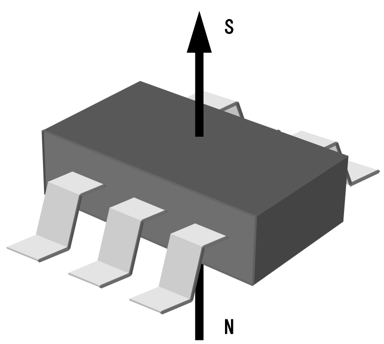


Figure1. Direction of applied magnetic field

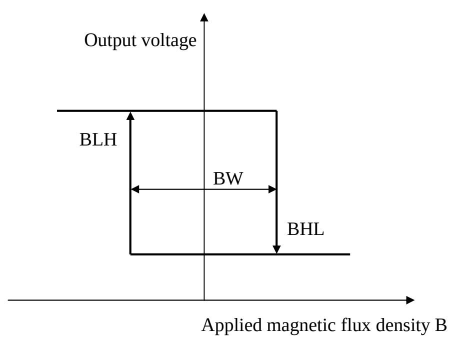
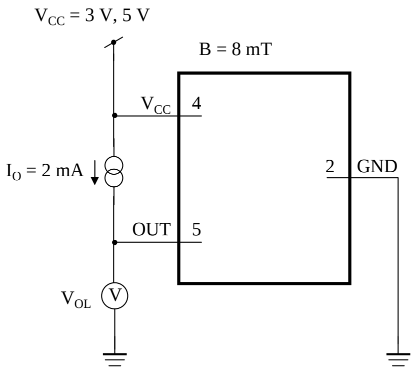


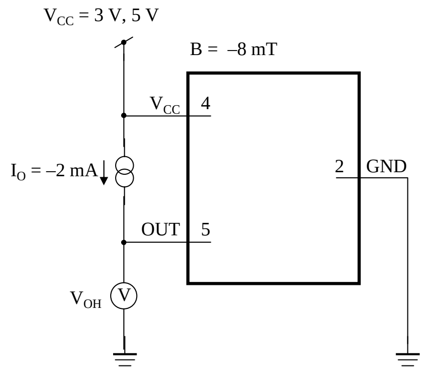
Figure2. Operating magnetic flux density

■ Test Circuit Diagram (continued)

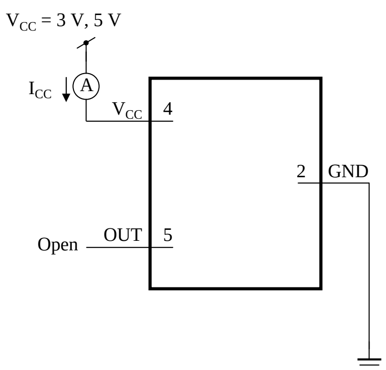
2. Test Circuit 2 V_{OL}



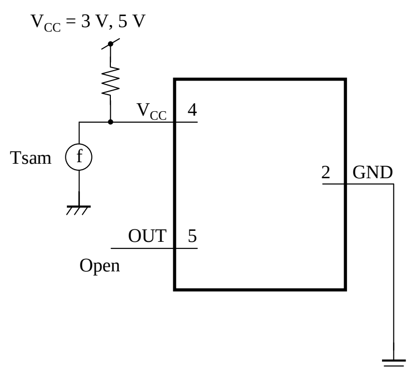
3. Test Circuit 3 V_{OH}



4. Test Circuit 4 I_{CC}



5. Test Circuit 5 Tsam



■ Usage Notes

¶ This IC is not applicable to automotive electronic parts.

■ Cautions when using Hall-IC

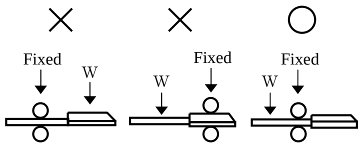
As the Hall-IC often detects movement, the position of the Hall-IC may be changed, and there is the risk of a change in detection level, if exposed to shock or vibration over a long period. Secure the IC by applying adhesive to the package or placing in a dedicated case.

1.When using an adhesive

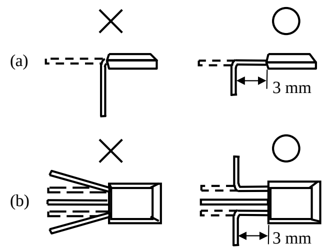
Some kinds of adhesive generate gas (such as chrole gas) during curing. This corrosive gas corrodes the aluminum on the surface of the Hall-IC, and may cause a functional defect of disconnection.
If Hall-IC is to be sealed after installation, attention should be given to the adhesive used for Hall-IC installation, as well as for the adhesive or resin used for peripherals and substrate cleaner.
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.When bending lead wire

Bend the lead wire without stressing the package.



Bending method of lead wire



Bending position of lead wire

3.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.
If a voltage of 5.4 V or more is thought to be applied to the power supply line (reverse electromotive force from coil or the ignition pulse, etc.), protect it with external components (capacitor, resistor, zener diode, diode, surge absorbing elements, etc.).

4.Mounting the surface mount type (MINI-3D and SMINI-5D packages)

When mounted on printed circuit board, the Hall-IC may be highly stressed by the warpage 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.

Observe the recommended conditions since electrical characteristics can easily change due to stress when mounting. Avoid solding by using soldoring iron or solder flow (dip) method.

■ Cautions when using Hall-IC (continued)

5.Mounting the insertion type (SE-3S package)

If the insertion type Hall-IC is inserted to the bottom of its lead into the printed circuit board, it will be stressed so that reliability can not be maintained. Set a space of at least 2.0 mm between the package and printed circuit board.

6.V_{CC} and GND

Do not connect VCC and GND pins reversely. Otherwise, the IC will be damaged. If the voltage of GND pin is set higher than that of the other pins, which is the same configuration as diode forward connection, it is set to ON at current may flow, resulting in damage to the IC. (This is common to monolithic IC.)

7.Cautions of Hall IC at Power-On

When a Hall IC is turned on, the position of the magnet or looseness may cause the output of a Hall IC to be changed, and a pulse may be generated.

Therefore, care should be exercised whenever the output state of a Hall IC is critical when the supply power is ON.

8.When Hall-IC is fixed with holder

When a Hall-IC is mounted on the printed circuit board with a holder and the coefficient of expansion of the holder is large, the lead wire of the Hall-IC will be stretched and it may give a stress to the Hall IC.

If the lead wire is stressed intensely due to the distortion of holder or substrate, the adhesiveness between the package and the lead wire may be weakened and cause a minute gap resulting in the deterioration of its resistance to moisture.

9. On using flux in soldering

Choose a flux which does not include ingredients from the chloric group. The ingredients of chloric group may enter through the joint of the lead frame and package resin, causing corrosion and disconnection of the aluminum wiring on the surface of IC chip.