Low-Power Hall Switch

FEATURES

- Micro power consumption
- 2.4V to 5.5V battery operation
- Chopper Amplifier based design:
  Insensitive to noise and offset caused by process variations, operating temperatures and mechanical stress
- Digital output
- Programmable output direction
- CMOS process

GENERAL DESCRIPTION

FD2H001A/BH_LF is a low-power integrated Hall switch designed to sense the applied magnetic flux density and give a digital output, which indicates the present condition of the magnitude sensed. One example of the applications is the on/off switch in cellular flip-phones.

The micro power design is especially suitable for battery-operated systems such as cellular phones or laptop computers, in which power consumption is one major concern. The typical power consumption of FD2H001A/BH_LF is below 10μW at 2.7V.

The magnetic switching points are precise and insensitive to process and temperature variations.

For FD2H001AH_LF, the output will be at the “low” level when no magnetic field is applied. When the applied magnetic flux density is stronger than the switching threshold, the output would be at the “high” level.

For FD2H001BH_LF, the output will be at the “high” level when no magnetic field is applied. When the applied magnetic flux density is stronger than the switching threshold, the output would be at the “low” level.

BLOCK DIAGRAM

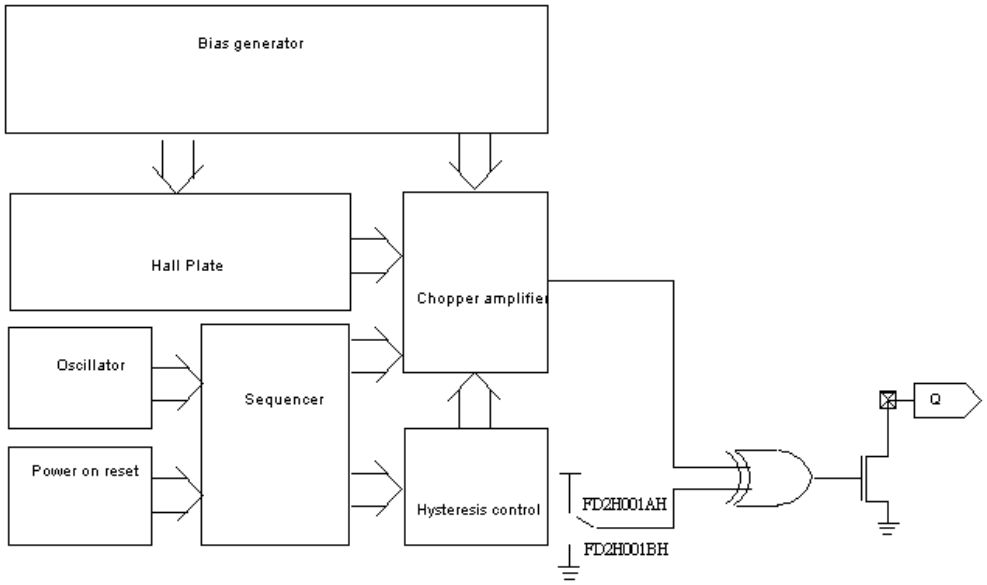
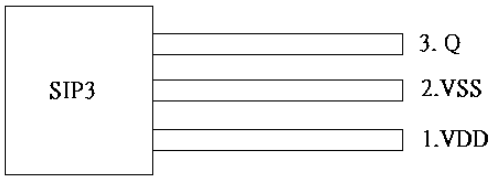


Figure.1

PIN CONNECTION

Figure.2



FD2H001A/BH_LF

PIN DESCRIPTIONS

Name	I/O	Description
Q	O	Open Drain output
VDD	P	Positive supply
VSS	G	Ground

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

2.0 FUNCTIONAL DESCRIPTIONS

Refer to the block diagram (Figure.1), FD2H001A/BH_LF is composed of the following building blocks:

- Bias generator

The bias generator provides precise, temperature and process insensitive current sources for both the Hall plate and the chopper amplifier. These current sources in turn guarantee proper operation of the chip and precise switching thresholds under all kinds of environments specified in the specification.

- Oscillator + Sequencer

The built-in oscillator provides the clock signal, which is taken by the sequencer to determine the periods of the operating phase and the stand-by phase. Typically the operating time is about 60us and the stand-by time is 150ms. Using such a clocking scheme, the average power consumption is almost equal to that in the stand-by phase, which is under 10μW at 2.7V.

- Power on Reset

Used to detect the power-up ramp and reset the digital circuits to attain correct operation as soon as the power is ready.

- Chopper Amplifier

To achieve a higher resolution the chopper amplifier structure is adopted in this design. Use of this structure dynamically removes both the offset and flicker noise at the same time.

- Hysteresis Control

This block determines the switching threshold of the Hall switch in different situations.

ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Values		Unit
		min.	max.	
Ambient Operating Temperature	-	-40	85	℃
Storage Temperature	-	-40	150	℃
DC Supply Voltage	-	2.4	5.5	V
Supply Current	-	-1	2.5	mA
Programming Pin Voltage (only available for FD2H001L_LF)	With respect to VSS	-0.3	5.5	V
Magnetic Flux Density	-		unlimited	mT

OPERATING CONDITIONS

Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Supply Voltage	-	2.4	2.7	5.5	V
Output Voltage	-	-0.3	2.7	5.5	V
Ambient Temperature	-	-40	25	85	℃

ELECTRICAL CHARACTERISTICS

Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Average Supply Current			3[1]	20	μA
Average Supply Current (operating phase)			1.1[1]		mA
Average Supply Current (stand-by phase)			2.5[1]		μA
Output Saturation Voltage			0.1		V
Output Leakage Current			0.01		μA
Operating time			60		μs
Standby time			150		ms
Duty cycle			0.04		%

1. operating voltage 2.7V

MAGNETIC CHARACTERISTICS

FD2H001AH_LF

Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Operate Points ($\|B_{OP}\|$)		30	45	60	G
Release Points ($\|B_{RP}\|$)		40	55	70	G
Hysteresis		5	10	15	G

FD2H001BH_LF

Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Operate Points ($\|B_{OP}\|$)		40	55	70	G
Release Points ($\|B_{RP}\|$)		30	45	60	G
Hysteresis		5	10	15	G

MAGNETIC FLUX

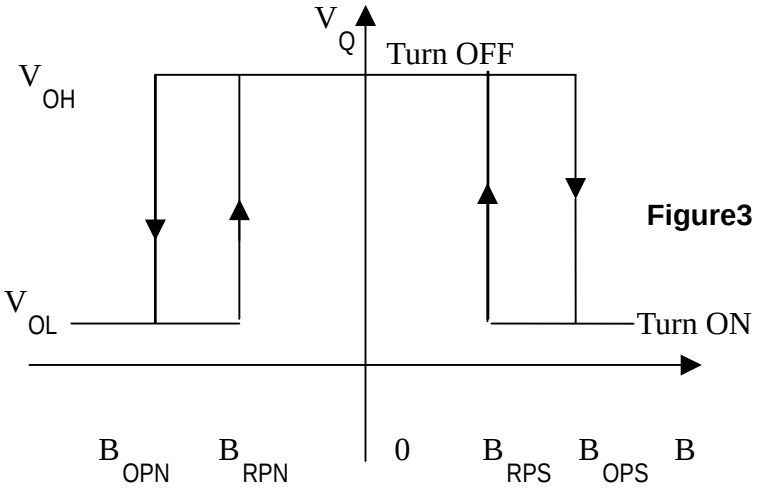


Figure3 . FD2H001BH_LF

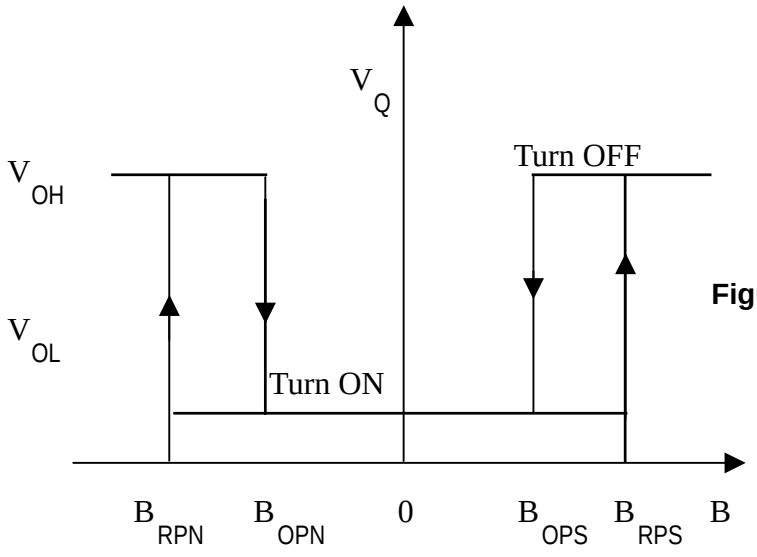


Figure4 . FD2H001AH_LF

TYPICAL CHARACTERISTICS (For Example FD2H001BH_LF)
7

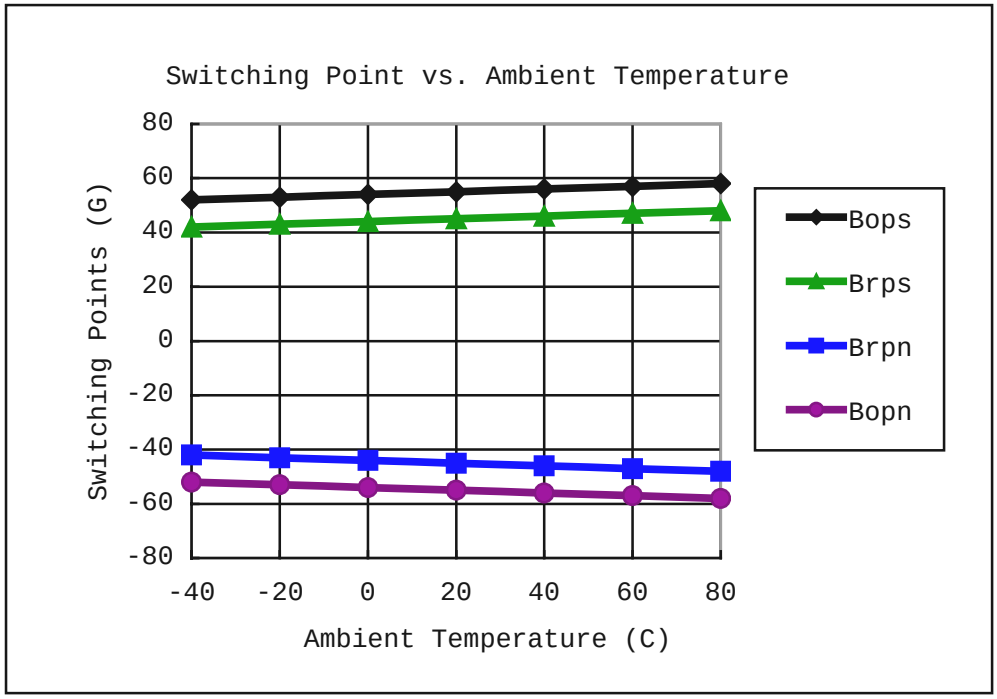


Figure.5 Magnetic Switch Points Versus Ambient Temperature (VDD=2.7V)

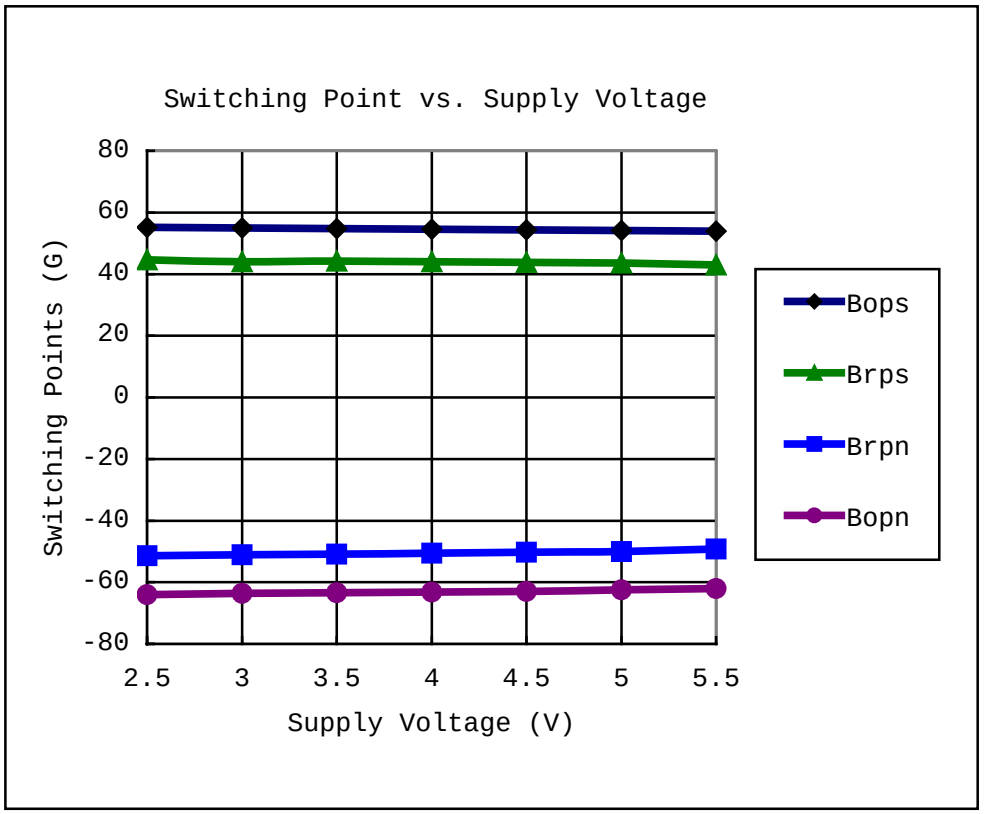


Figure.6 Magnetic Switch Points Versus Supply Voltage (Ta=25C degree)

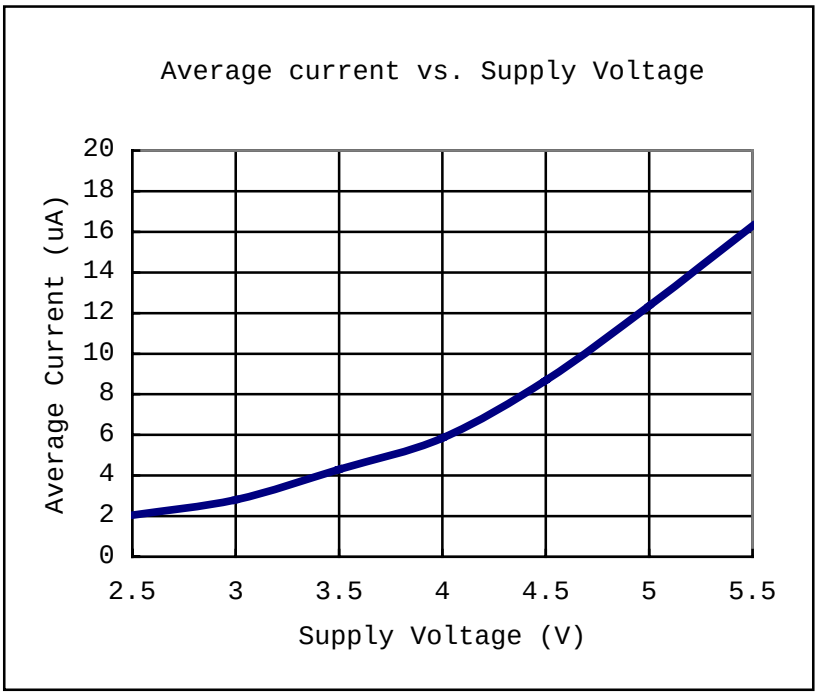


Figure.7 Average Current Versus Supply Voltage (Ta=25C degree)

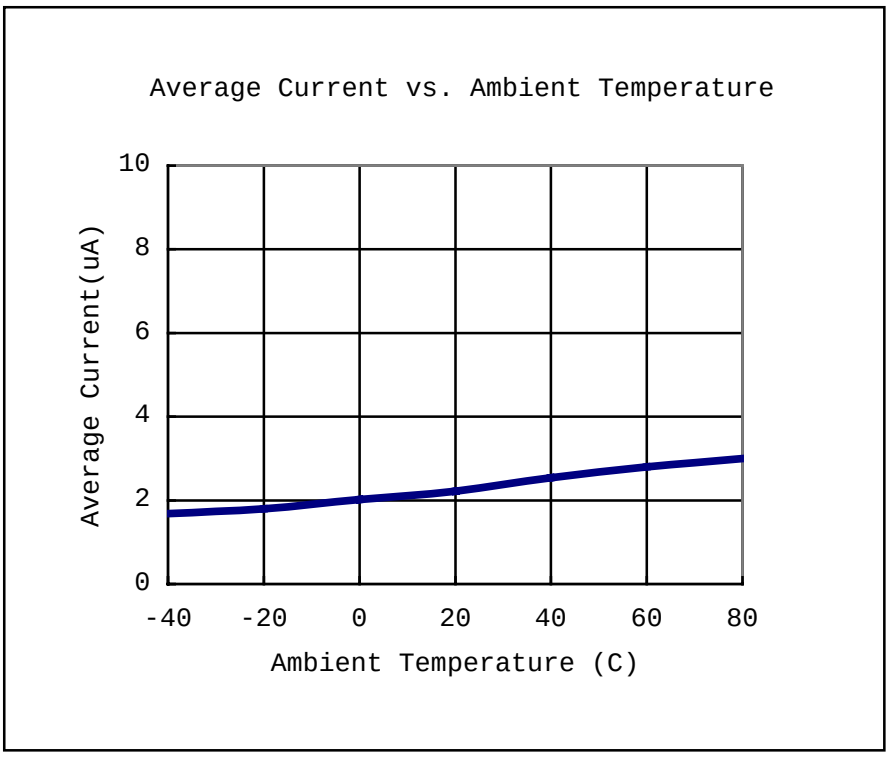
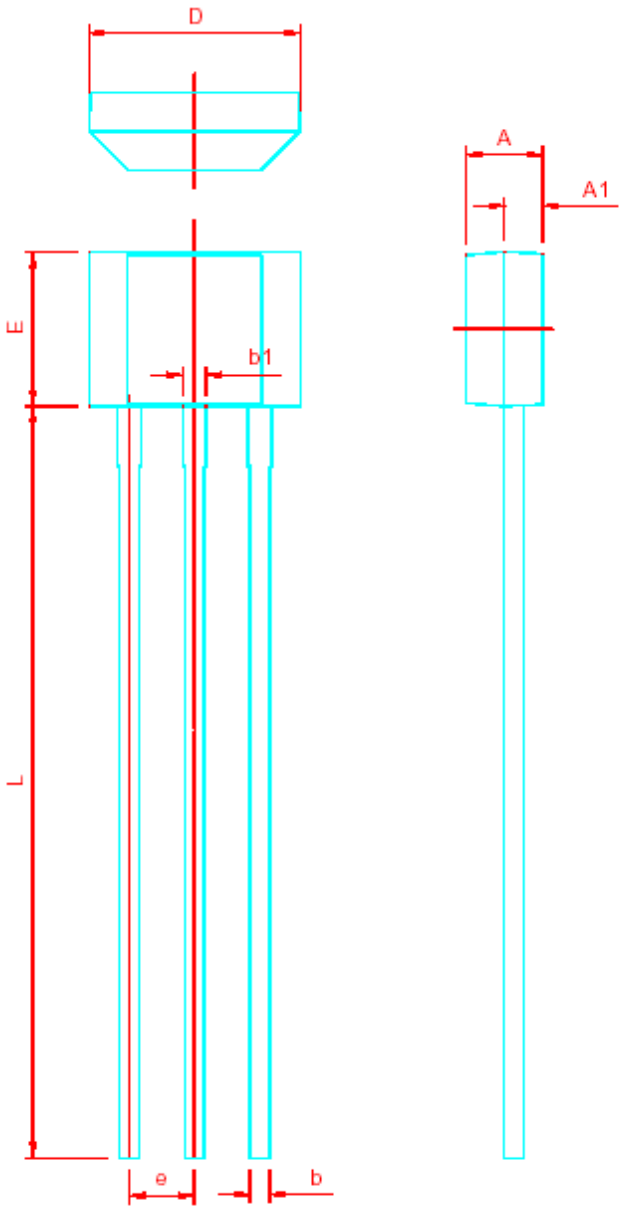


Figure.8 Average Current Versus Ambient Temperature (VDD=2.7V)

PACKAGE DIMENSION

Unit : MM

SIP-3L



REF	Millimeter		REF	Millimeter	
	Min	Max		Min	Max
A	1.245	1.753	**D**	3.962	4.216
A1	0.750 REF		**E**	2.870	3.124
b	0.330	0.432	**L**	13.60	15.60
b1	0.406	0.508	**e**	1.27 REF	

APPLICATION REFERENCE

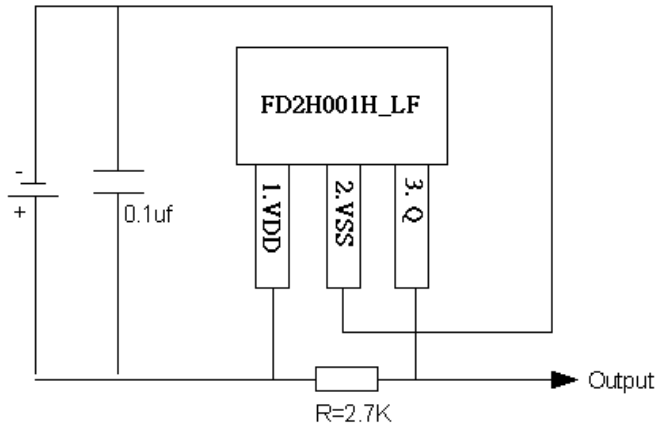


Figure10 . FD2H001A/BH_LF Application Circuit

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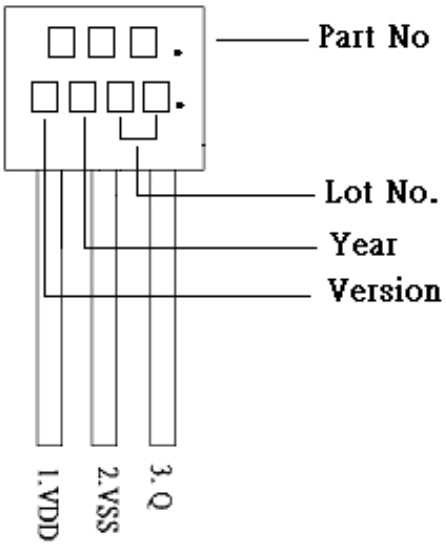

ORDER INFORMATION

Type	Marking	Package
FD2H001AH_LF	001 CYNN	SIP-3L
FD2H001BH_LF	001 CYNN	SIP-3L