AH3661 Omnipolar Micropower Hall Effect Sensor

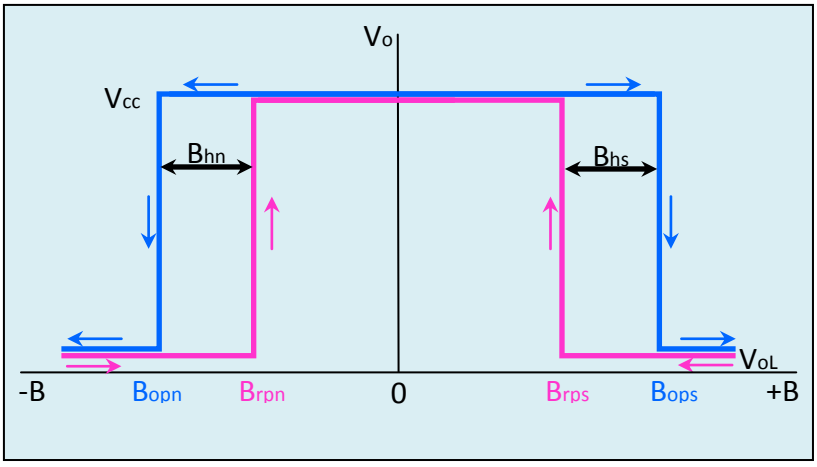
◆ Outline

AH3661 is an Omnipolar micro-power high sensitivity Hall effect sensor which designed for battery-powered handheld digital devices. The sensor chip integrated with voltage regulator, Hall effect voltage generator, dynamic offset compensated, temperature compensation, wake / sleep controller, differential amplifier, Schmitt trigger, logic controller, as well as open-drain output driver and other circuit unit. Specially designed circuit enables the sensor has a full magnetic pole (regardless S pole or N pole) magnetic field excitation function, excellent symmetry of the positive and negative magnetic switch, and very small average current consumption characteristics.

◆ Magnetic and electric transfer characteristic

◆ Omnipolar switch type Hall effect sensor magnetic and electric transfer characteristic：

When the magnet(regardless S pole or N pole) is closed to sensor（｜B｜≥｜Bop｜），the sensor outputs low level; When the magnet is far away with the sensor（｜B｜≤｜Brp｜）, the sensor outputs high level. Stable hysteresis （Bhx =｜Bopx--Brpx｜）enables the sensors stable switch state. The sensors' magnetic and electric transfer characteristic curve is shown as the figure:



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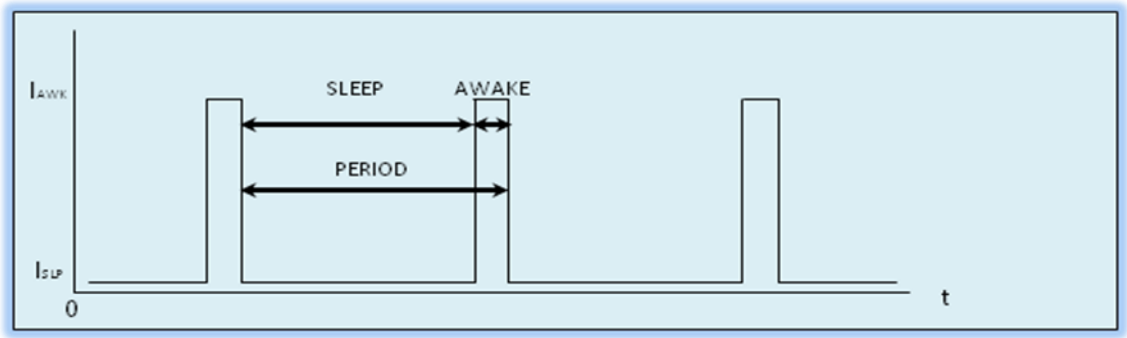
- Awake/sleep cycle

The product chip is with built-in awake/sleep clock control circuit, its awake/sleep cycle time is shown as the figure。



◆ Ordering Information

- Part No. and order mark：

AH 3661 M/UA

Package form code

Part No. code

Trademark code

- Package Form and outer packing

Package code	Package form	Outer packing
M	SOT-23-3L（SMD）	Reel,3kpcs/reel
UA	TO-92UA/TO-92S（DIP）	Bag,1kpcs/bag, or 0.5kpcs/bag

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◆ Features

- Rated working voltage 2.4V ~ 5.5V,
- Work under Omnipolar, the excitation field regardless of N or S pole, high magnetic sensitivity, highly symmetric of positive and negative magnetic switching points;
- Built-in dynamic offset voltage compensation circuit, high temperature stability, small drift switching point, resistance to mechanical stress and thermal stress;
- Ultra small power consumption, it's only 8μW when the power supply is 2.75V ;
- Immune to ESD which is greater than 5kV (body static mode, Human-Body Model, HBM);
- Products meet the EU RoHS instruction 2011/65 / EU and REACH regulations 1907/2006 / EU requirements.

◆ Application

- Notebook computers, scanners, handheld digital devices door or lid closed state detection
- The print head position sensing for mobile printer;;
- Small handheld medical devices or dental equipment;
- Battery-powered injection pump, insulin pumps or other portable medical equipment;
- Trigger switch of battery-powered hand tools
- Shift detection for battery-powered reed switches in security system;
- Gated (array) magnetic encoders;
- Switch open or closed detection for Battery-powered small electric appliance(Dust collector, Fan etc)
- Flow measurement for battery-powered remote gas meter or water meter;
- Current detection and anti-stealing sensing in intelligent electric meter;
- Object low frequency displacement and rotation detection;

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◆ Limit Condition

Parameter	Symbol	Limit Value		Unit
		Min.	Max	
Storage temp.	T_S	-55	150	℃
Supply voltage	V_{CC}	2.4	7	V
Admitting power loss	p_d	—	300 [a]	mW
Magnetic strength	B	Unlimited	Unlimited	mT
Output current	I_O	—	5	mA

[a] On the glass fiber epoxy resin that is 50 mm ×50 mm ×1.6 mm

◆ Operating Condition

Parameter	Symbol	Value		Unit
		Min.	Max.	
Supply voltage	V_{CC}	2.4	5.4	V
Operating Temp.	T_a	-40	85	℃
Output current	I_O	—	5	mA

◆ Electrical characteristic

Parameter		Symbol	Test condition	Value		Unit
				Typ.	Max.	
output low level voltage		V_{OL}	V_{CC1}= V_{CC2}=2.75V， I_O=1mA， $B \geq B_{OP}$	0.1	0.25	V
Supply current	Awake	I_{AWK}	Awake， V_{CC1}=2.75V， Vo Open circuit	3	5	mA
	Sleeping	I_{SLP}	Sleeping， V_{CC1}=2.75V， Vo Open circuit	2	4	μA
	Average	I_{AVG}	V_{CC1}=2.75V， Vo Open circuit	2.75	5.25	μA
Awake time		t_{AWV}	V_{CC1}= 4V， R_L=200Ω， Vo Open circuit	45	90	μ s
Cycle		t_P		90	180	m s
Duty factor		f_d		0.05	—	%

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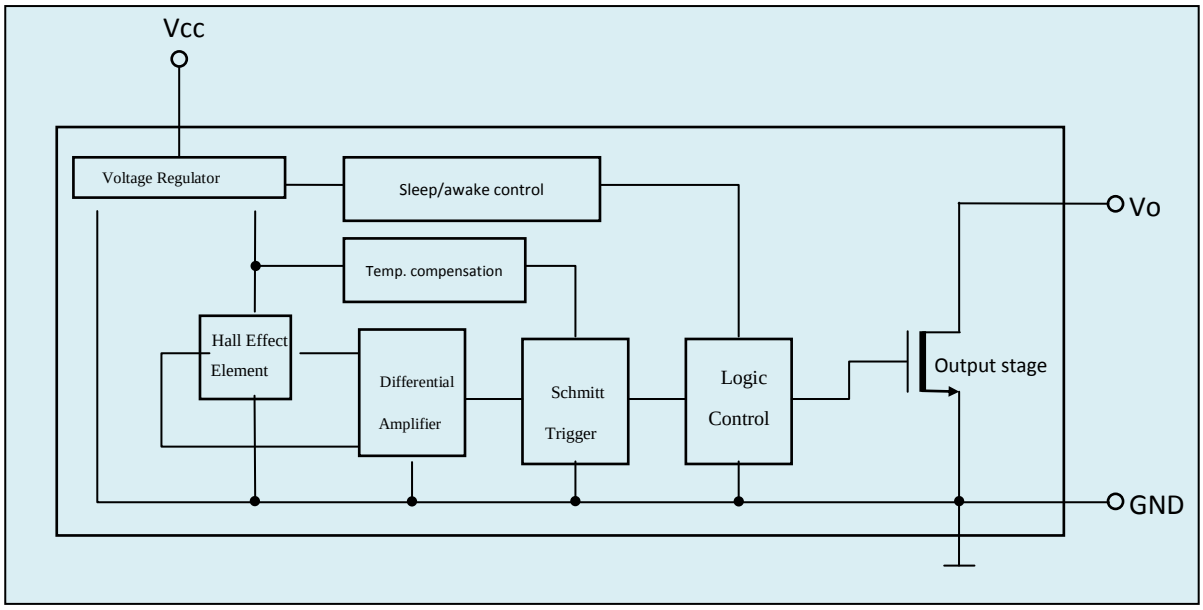
◆ Magnetic Characteristic

Parameter	Symbol		Test condition	Value		
				Min.	Typ.	Max.
Operating point Magnetic strength	S pole faces the product mark	B_{OPS}	$V_{CC1} = V_{CC2}$ =2.75V I_O = 1 mA	—	3.5	7
	N pole faces the product mark	B_{OPN}		−7	-3.5	—
Release Point magnetic strength	S pole faces the product mark	B_{RPS}		1	2.5	—
	N pole faces the product mark	B_{RPN}		—	-2.5	−1
Hysteresis	$\lvert B_{OPX} - B_{RPX} \rvert$	B_{HX}		—	1	6

Note1： Unit is mT,1mT (mT）=10（Gs）
Note 2: Pole S is vertical to the mark surface of the product, the field defined into $B > 0$。
Note3: The operating field of M type (SOT23-3L) is subject to pole “N”.

● Block Diagram



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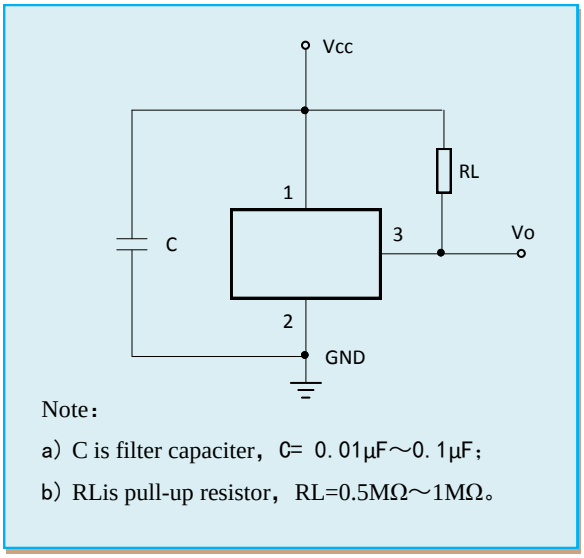
● Pin Function

Pin No.	Pin Symbol	Pin Name	Function	
			When | B | ≥ | Bop |	When | B | ≤ | Brp |
1	*Vcc*	Power supply	Power Supply（+）	
2	*GND*	Ground	Power Supply（-）	
3	*Vo*	Output	Low Level	High Level

◆ Typical Application Circuit



Note：

a）C is filter capaciter，C= 0.01μF～0.1μF；

b）RLis pull-up resistor，RL=0.5MΩ～1MΩ。

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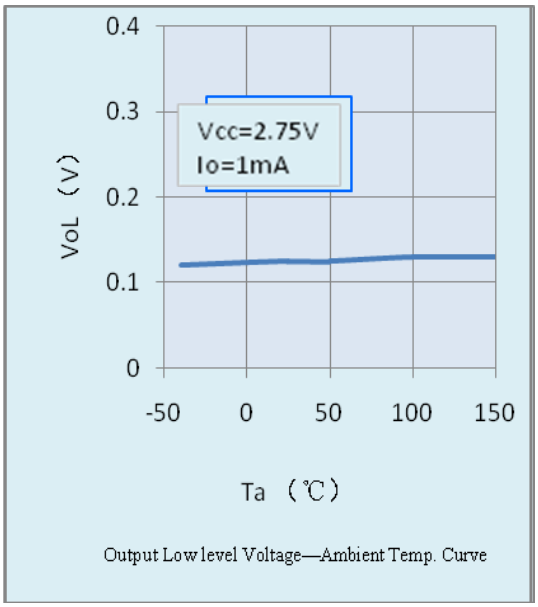
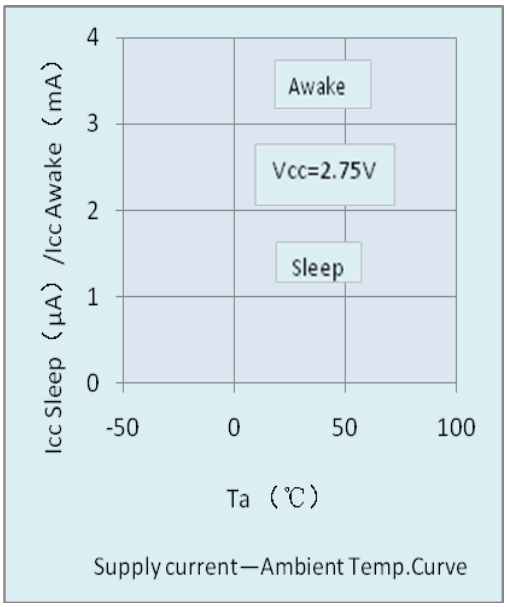
Typical Characteristic Curve

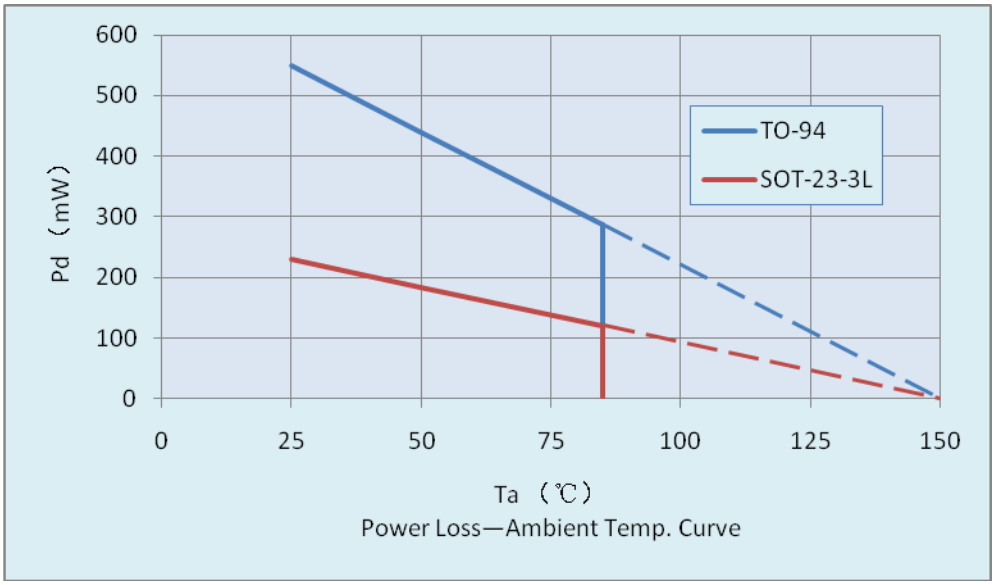
- Electrical Characteristic



Output Low level Voltage—Ambient Temp. Curve



Supply current—Ambient Temp.Curve



Power Loss—Ambient Temp. Curve

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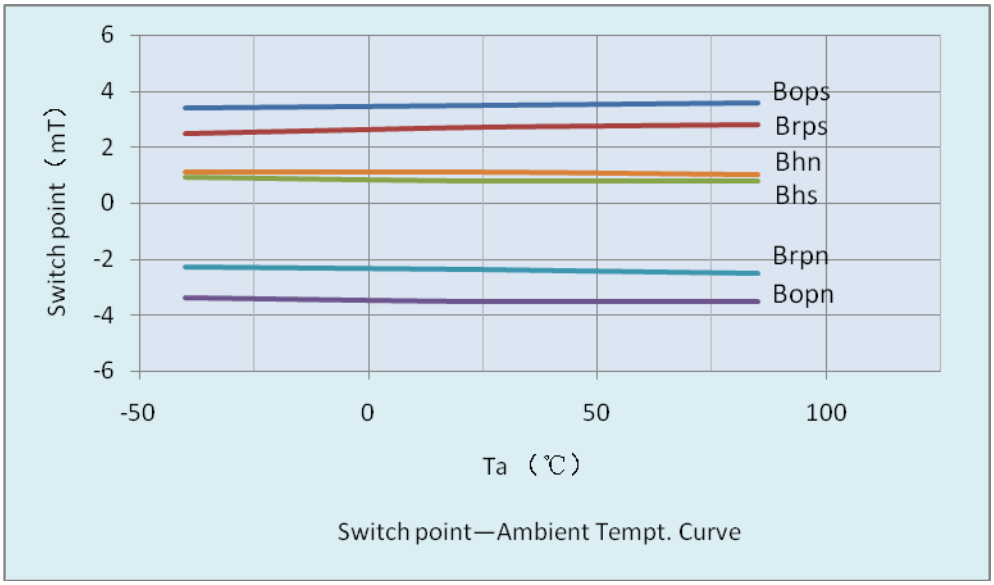
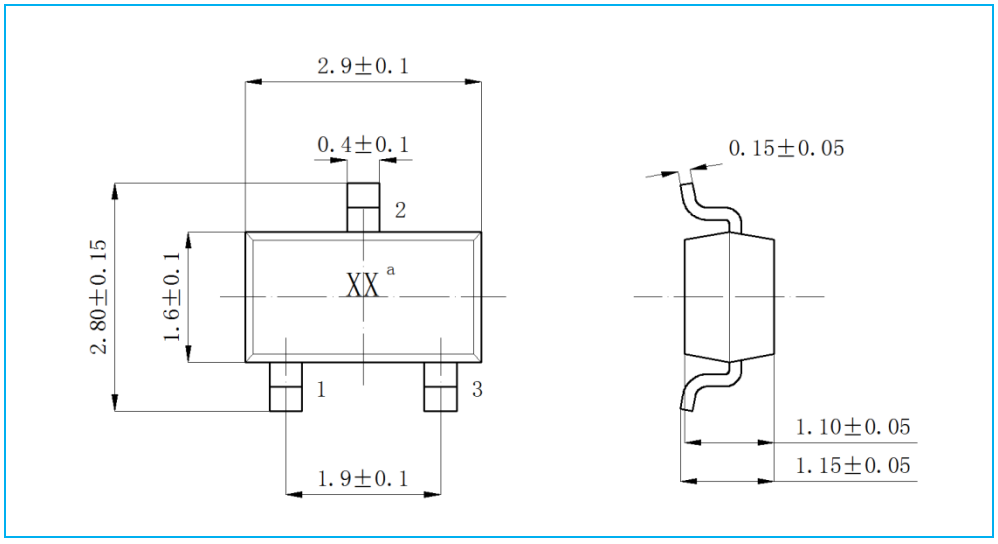
- Magnetic Characteristic



◆ Package Outline and Pin Identify

- SOT-23-3L（M Type）Package Figure（Unit:mm）



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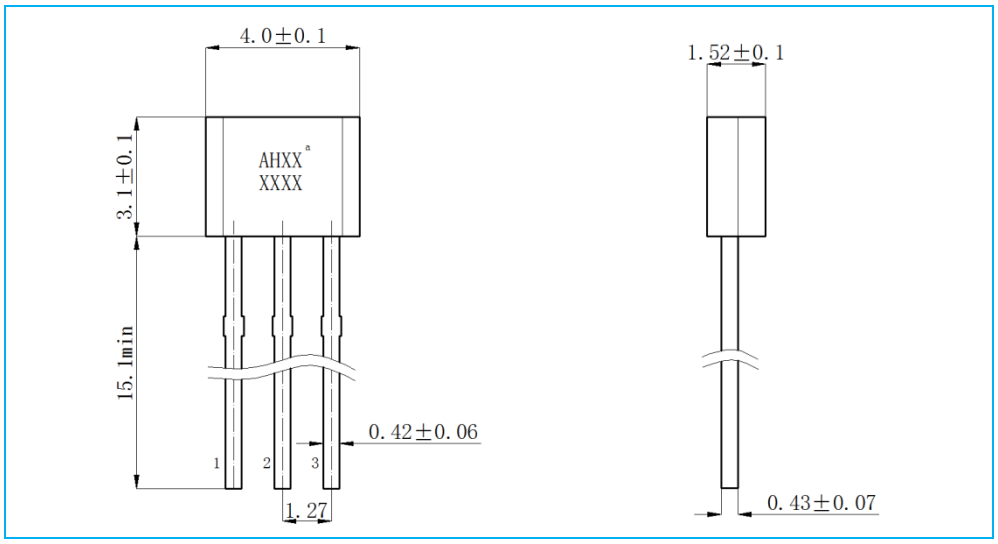
- TO-92UA/TO-92S（UA type）Package Figure（Unit:mm）



Note: In the package outline figure, Pin 1 is Vcc, Pin 2 is GND, Pin 3 is output

- Mark

  Mark XX or AHXX means abbreviated parts No., the second line XXXX means product lot No.

- Pin configuration

  a) M Type: It faces product mark, and two pins are downward, towards the left, clockwise, the pin No. is 1、2、3 in turn.

  b) **UA Type:** It faces product mark, and the pins are downward, from left to right, the pin No. is 1、2、3 in turn.

Important Declaration

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