

## Description

The AH1911/AH1921 is an ultra-low power digital Omnipolar Hall Effect switch IC from Diodes broad Hall Effect switches family. Thanks to the hibernating clocking system, the average supply current is only 1.6µA at 3V, which makes the AH1911/AH1921 perfectly fit battery-powered consumer products, Gas or water meter, smoke detectors and IoT devices. The wider range of supply voltage (1.6V to 5.5V) extends battery operating time and supports low voltage system microcontrollers, which provides great flexibility for system design. The advanced chopper stabilized design provides superior stability on switch operating point over temperature and supply voltage. The high ESD level up to 6kV helps to improve the system robustness.

The single push-pull for AH1911 or open drain for AH1921 output can be switched on with either South or North pole of sufficient strength. When the magnetic flux density (B) perpendicular to the package is larger than operate point (B<sub>OP</sub>), the output will be turned on (pulled low) and held until B is lower than release point (B<sub>RP</sub>).

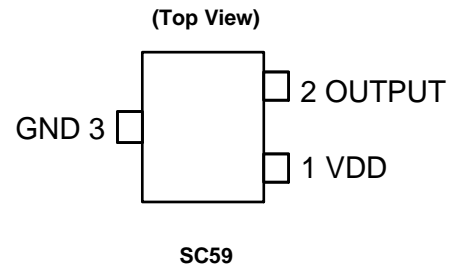
The AH1911/AH1921 comes with industry standard SC59 package.

## Features

- Omnipolar Operation (North or South Pole)
- Supply Voltage of 1.6V to 5.5V
- Micropower Operation
- Chopper Stabilized Design Provides:
  - Superior Temperature Stability
  - Minimal Switch Point Drift
  - Enhanced Immunity to Physical Stress
- AH1911 is Push-Pull Output and AH1921 is Open Drain Output
- -40°C to +85°C Operating Temperature
- High ESD Capability of 6kV (Human Body Model)
- Small Low Profile, SC59 Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

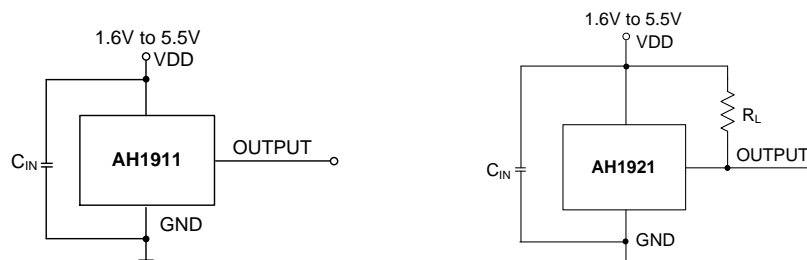
## Pin Assignments



## Applications

- Smart Cover or Dock Detect for Cellular Phones and Tablet PCs
- Gas or Water Consumption Measurement in Remote, Battery-Operated Utility Meters
- Medical Devices, IoT Systems
- Level, Proximity and Position Switches
- E-Locks, Smoke Detectors, Appliances

## Typical Applications Circuit (Note 4)



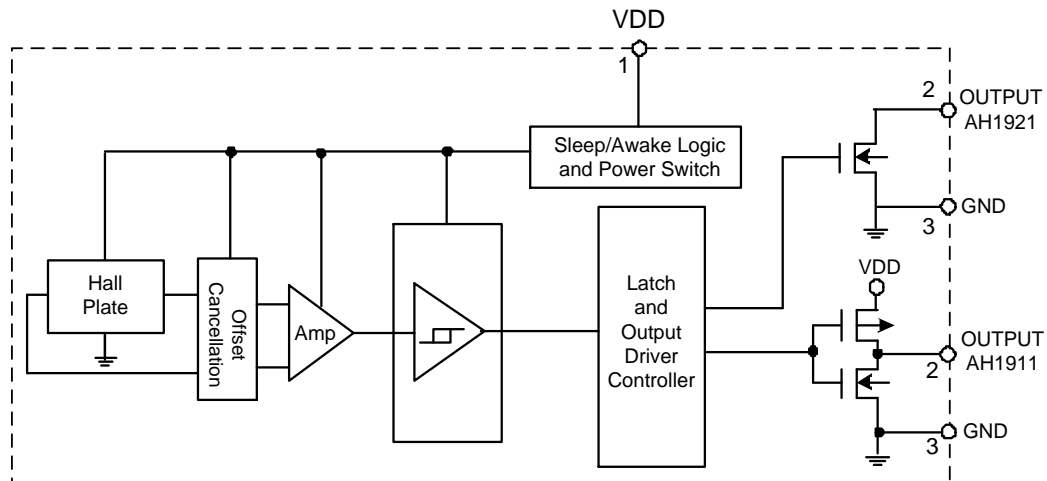
- Note: 4. C<sub>IN</sub> is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 100nF typical and should be placed as close to the VDD pin as possible.

## Pin Descriptions

Package: SC59

Pin Number	Pin Name	Function
1	VDD	Power Supply Input
2	OUTPUT	Output Pin
3	GND	Ground Pin

## Functional Block Diagram



## Absolute Maximum Ratings (Note 5) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit	
V <sub>DD</sub>	Supply Voltage (Note 6)	6	V	
V <sub>DD_REV</sub>	Reverse Supply Voltage	-0.3	V	
I <sub>OUTPUT</sub>	Output Current (Source and Sink)	1	mA	
B	Magnetic Flux Density	Unlimited		
P <sub>D</sub>	Package Power Dissipation	SC59	230	mW
T <sub>s</sub>	Storage Temperature Range	-65 to +150	°C	
T <sub>J</sub>	Maximum Junction Temperature	+150	°C	
ESD HBM	Human Body Model (HBM) ESD Capability	6	kV	

- Notes:
- Stresses greater than the 'Absolute Maximum Ratings' specified above may cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions exceeding those indicated in this specification is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.
  - The absolute maximum V<sub>DD</sub> of 6V is a transient stress rating and is not meant as a functional operating condition. It is not recommended to operate the device at the absolute maximum rated conditions for any period of time.

**Recommended Operating Conditions** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V <sub>DD</sub>	Supply Voltage	Operating	1.6 to 5.5	V
T <sub>A</sub>	Operating Temperature Range	Operating	-40 to +85	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, V<sub>DD</sub> = 3V, unless otherwise specified.)

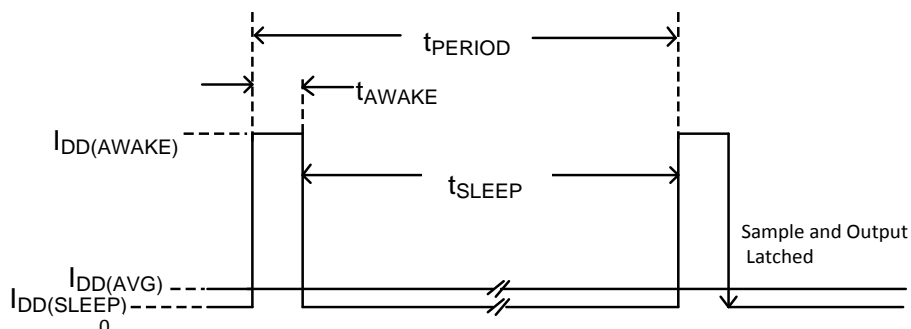
AH1911 Push-Pull Output

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	Output Low Voltage (On)	I <sub>OUT</sub> = 0.1mA	—	0.1	0.2	V
V <sub>OH</sub>	Output High Voltage (Off)	I <sub>OUT</sub> = -0.1mA	V <sub>DD</sub> -0.2	V <sub>DD</sub> -0.1	—	V
I <sub>DD(AWAKE)</sub>	Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3V	—	1	1.5	mA
		T <sub>A</sub> = -40 to +85°C, V <sub>DD</sub> = 1.6V to 5.5V	—	1	3	mA
I <sub>DD(SLEEP)</sub>	Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3V	—	0.6	1	µA
		T <sub>A</sub> = -40 to +85°C, V <sub>DD</sub> = 1.6V to 5.5V	—	0.6	3	µA
I <sub>DD(AVG)</sub>	Average Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3V	—	1.6	3	µA
		T <sub>A</sub> = -40 to +85°C, V <sub>DD</sub> = 1.6V to 5.5V	—	1.6	9	µA
t <sub>AWAKE</sub>	Awake Time	(Note 7)	30	45	80	µs
t <sub>PERIOD</sub>	Period	(Note 7)	30	45	80	ms
D.C.	Duty Cycle	—	—	0.1	—	%

AH1921 Open Drain Output

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OUT</sub>	Output On Voltage	I <sub>OUT</sub> = 0.1mA	—	0.1	0.2	V
I <sub>OFF</sub>	Output Leakage Current	V <sub>OUT</sub> = 5.5V, Output off	—	< 0.1	1	µA
I <sub>DD(AWAKE)</sub>	Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3V	—	1	1.5	mA
		T <sub>A</sub> = -40 to +85°C, V <sub>DD</sub> = 1.6V to 5.5V	—	1	3	mA
I <sub>DD(SLEEP)</sub>	Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3V	—	0.6	1	µA
		T <sub>A</sub> = -40 to +85°C, V <sub>DD</sub> = 1.6V to 5.5V	—	0.6	3	µA
I <sub>DD(AVG)</sub>	Average Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3V	—	1.6	3	µA
		T <sub>A</sub> = -40 to +85°C, V <sub>DD</sub> = 1.6V to 5.5V	—	1.6	9	µA
t <sub>AWAKE</sub>	Awake Time	(Note 7)	30	45	80	µs
t <sub>PERIOD</sub>	Period	(Note 7)	30	45	80	ms
D.C.	Duty Cycle	—	—	0.1	—	%

Note: 7. When power is initially turned on, the operating V<sub>DD</sub> (1.6V to 5.5V) must be applied to guaranteed the output sampling. The output state is valid after the second operating cycle (typical 90ms).

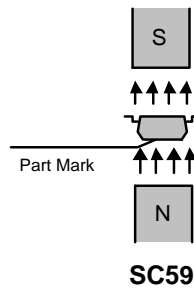
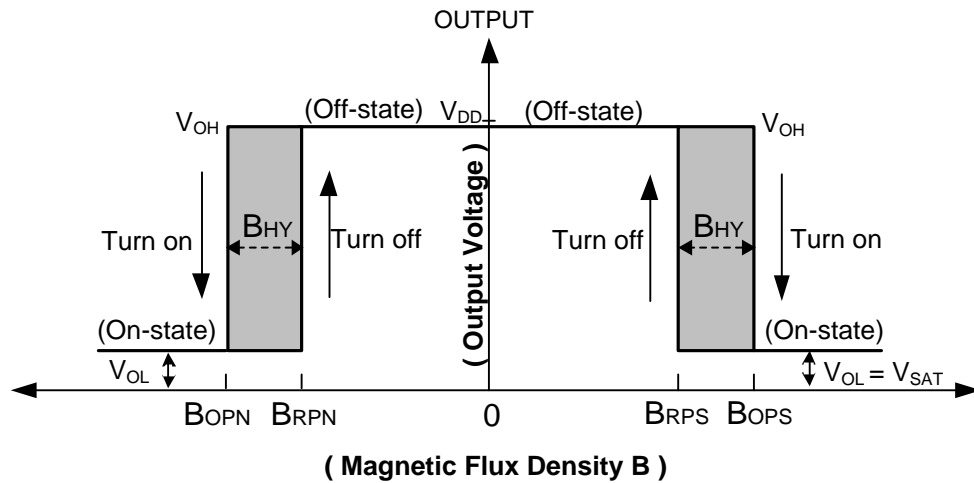


**Magnetic Characteristics** (Note 8) ( $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{DD} = 1.6\text{V}$  to  $5.5\text{V}$ , unless otherwise specified.)

(1mT=10 Gauss)

Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
$B_{OPS}$ (South Pole to the Non-Part Marking Side)	Operation Point	$V_{DD} = 1.6\text{V}$ to $5.5\text{V}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	30	60	90	Gauss
$B_{OPN}$ (North Pole to the Non-Part Marking Side)		$V_{DD} = 1.6\text{V}$ to $5.5\text{V}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	-90	-60	-30	
$B_{RPS}$ (South Pole to the Non-Part Marking Side)	Release Point	$V_{DD} = 1.6\text{V}$ to $5.5\text{V}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	22	45	67	
$B_{RPN}$ (North Pole to the Non-Part Marking Side)		$V_{DD} = 1.6\text{V}$ to $5.5\text{V}$ $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	-67	-45	-22	
$B_{HY}$ ( $ B_{OPX}  -  B_{RPX} $ )	Hysteresis	—	—	15	—	

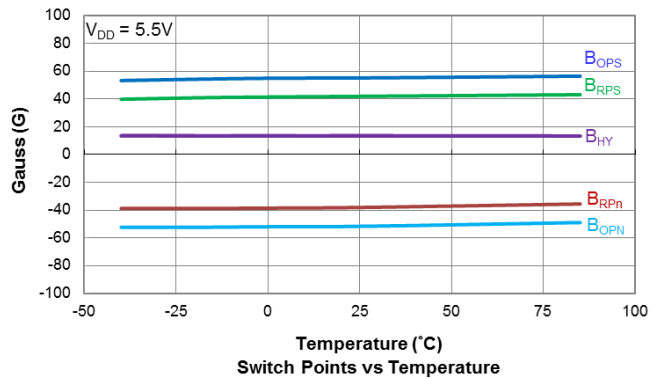
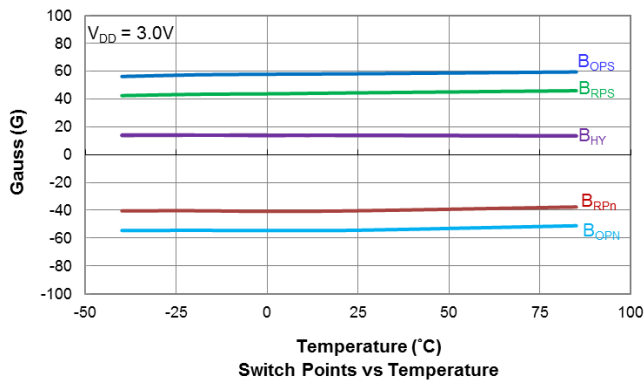
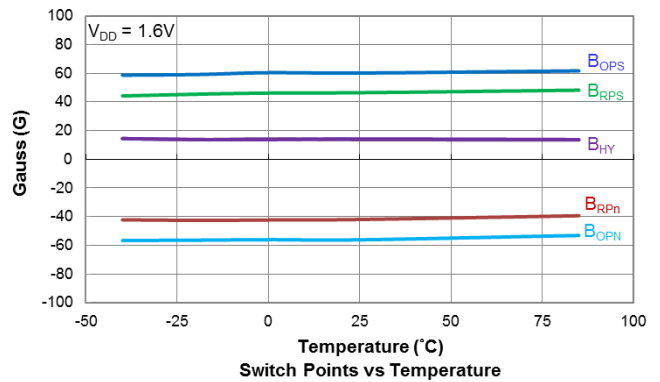
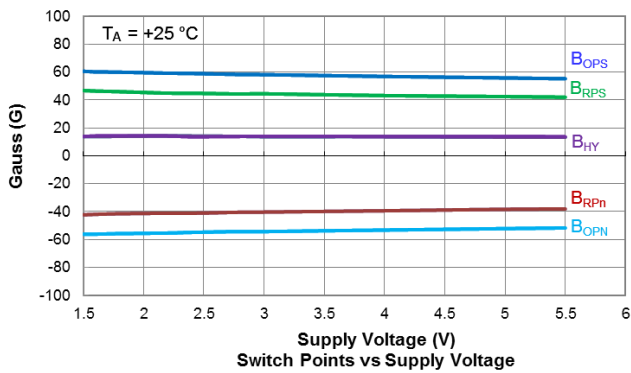
Notes: 8. Maximum and minimum parameters values over operating temperature range are not tested in production, they are guaranteed by design, characterization and process control. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.



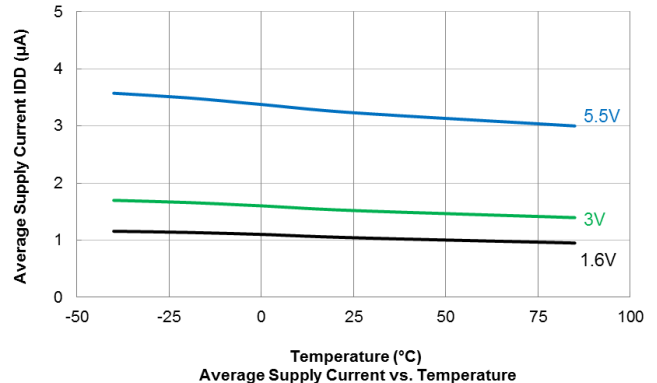
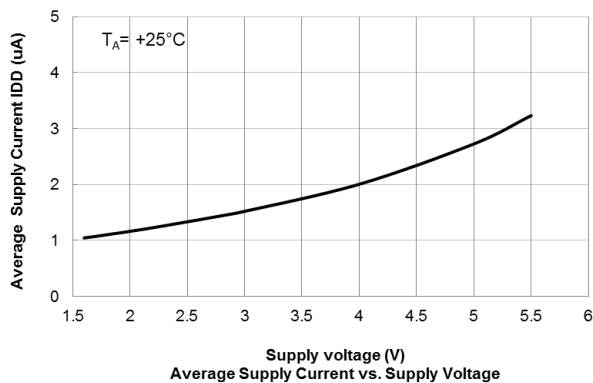
NEW PRODUCT

**Typical Operating Characteristics**

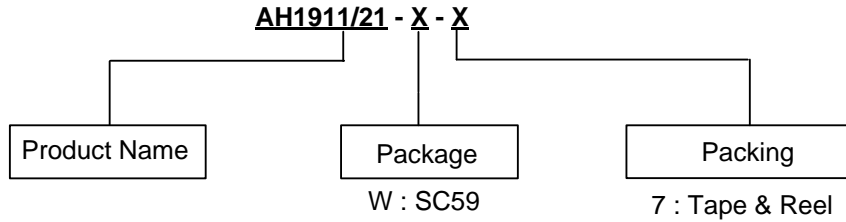
**Output Switch Operate and Release Points (Magnetic Thresholds)**



**Average Supply Current**



**Ordering Information**

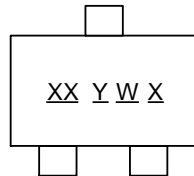


Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
AH1911-W-7	W	SC59	3000/Tape & Reel	-7
AH1921-W-7	W	SC59	3000/Tape & Reel	-7

**Marking Information**

(1) Package Type: SC59

( Top View )



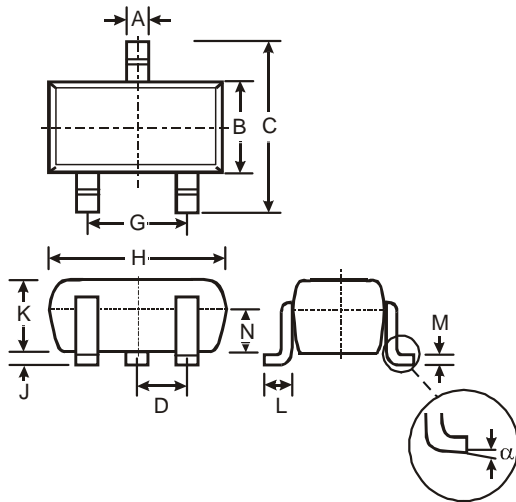
**XX** : Identification Code  
**Y** : Year 0 to 9  
**W** : Week : A to Z : 1 to 26 week;  
 a to z : 27 to 52 week; z represents  
 52 and 53 week  
**X** : Internal Code

Part Number	Package	Identification Code
AH1911-W-7	SC59	KW
AH1921-W-7	SC59	KZ

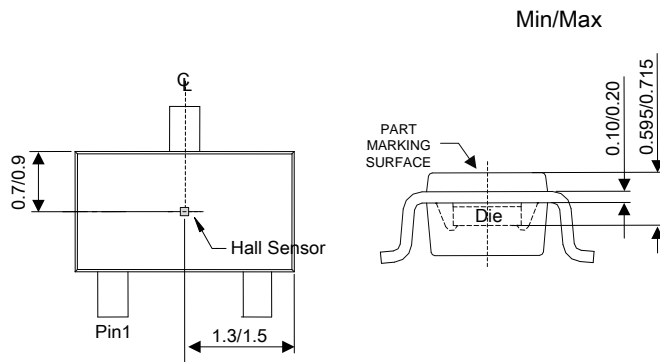
**Package Outline Dimensions** (All dimensions in mm.)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SC59



SC59			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			



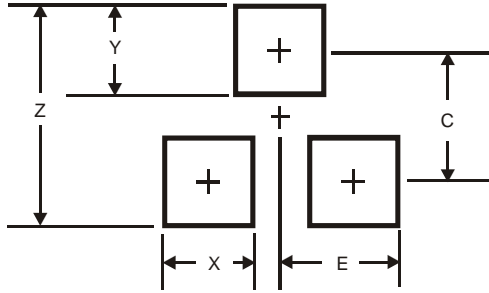
Sensor Location

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**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SC59



Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1.0
C	2.4
E	1.35

NEW PRODUCT



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