

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_{OP}), the output will be turned on (pulled low) and held until B is lower than release point (B_{RP}).

The AH1911/AH1921 comes with industry standard SC59 package.

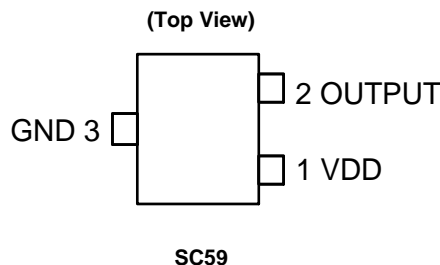
Features

- 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.

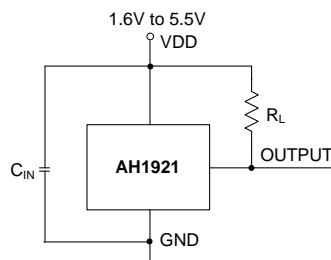
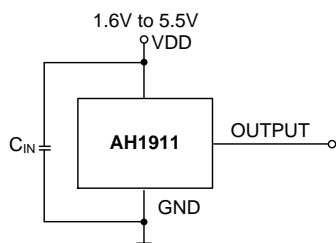
Pin Assignments



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)



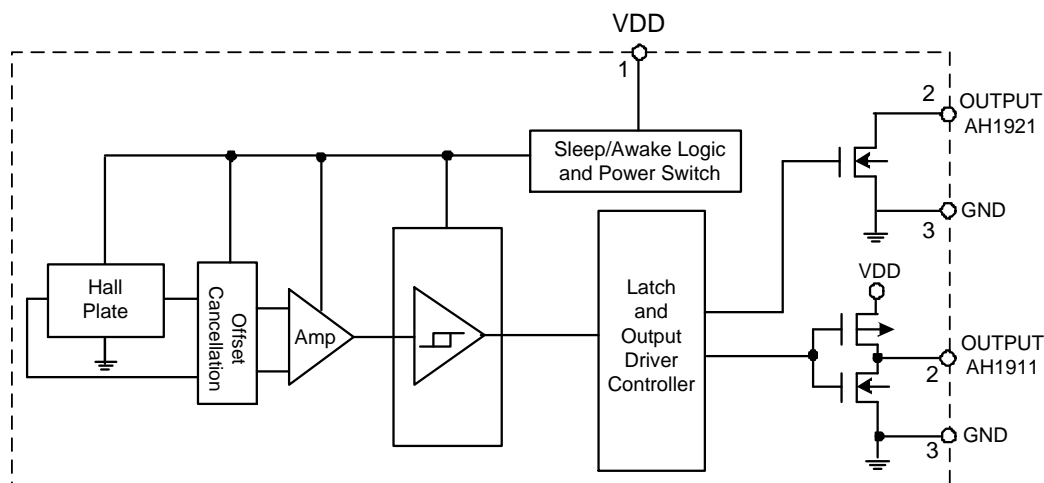
Note: 4. C_{IN} is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 100nF typical and should be placed as close to the VDD pin as possible.

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_A = +25°C, unless otherwise specified.)

| Symbol | Parameter | Rating | Unit |
|---------------------|---------------------------------------|-------------|------|
| V _{DD} | Supply Voltage (Note 6) | 6 | V |
| V _{DD_REV} | Reverse Supply Voltage | -0.3 | V |
| I _{OUTPUT} | Output Current (Source and Sink) | 1 | mA |
| B | Magnetic Flux Density | Unlimited | |
| P _D | Package Power Dissipation SC59 | 230 | mW |
| T _s | Storage Temperature Range | -65 to +150 | °C |
| T _J | 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_{DD} 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_A = +25°C, unless otherwise specified.)

| Symbol | Parameter | Conditions | Rating | Unit |
|-----------------|-----------------------------|------------|------------|------|
| V _{DD} | Supply Voltage | Operating | 1.6 to 5.5 | V |
| T _A | Operating Temperature Range | Operating | -40 to +85 | °C |

Electrical Characteristics (@T_A = +25°C, V_{DD} = 3V, unless otherwise specified.)

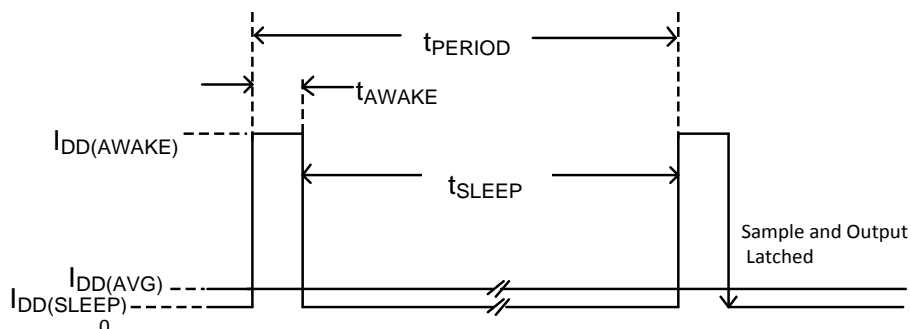
AH1911 Push-Pull Output

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

Note: 7. When power is initially turned on, the operating V_{DD} (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).

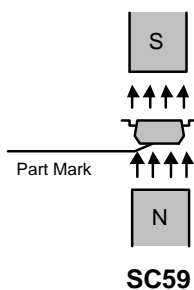
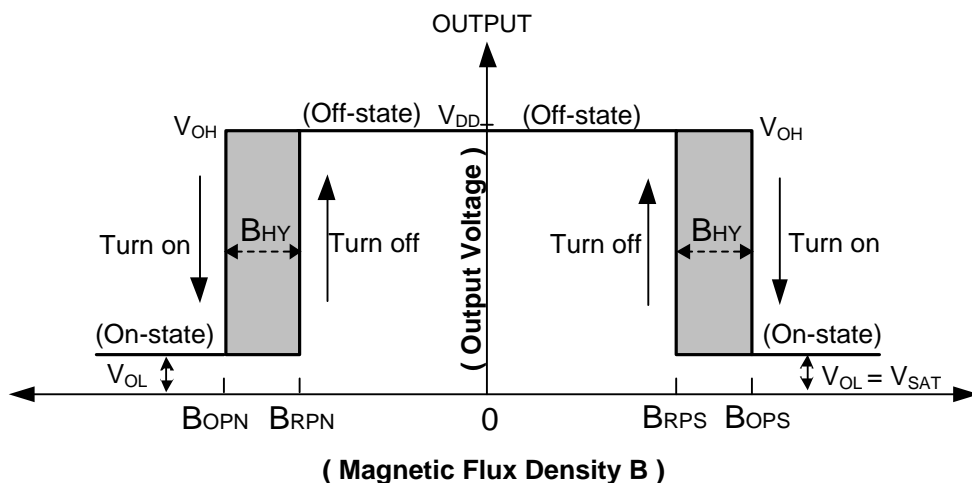


Magnetic Characteristics (Note 8) ($T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 1.6\text{V}$ to 5.5V , unless otherwise specified.)

(1mT=10 Gauss)

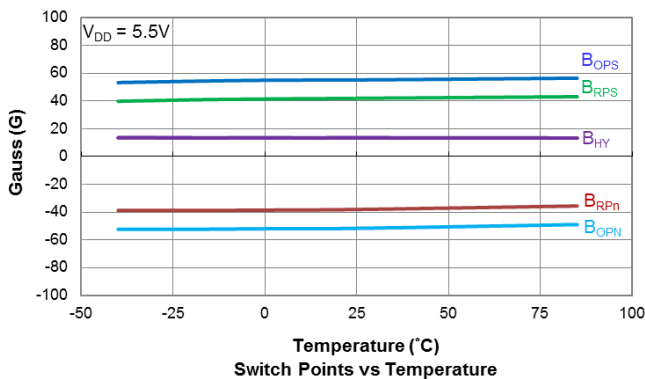
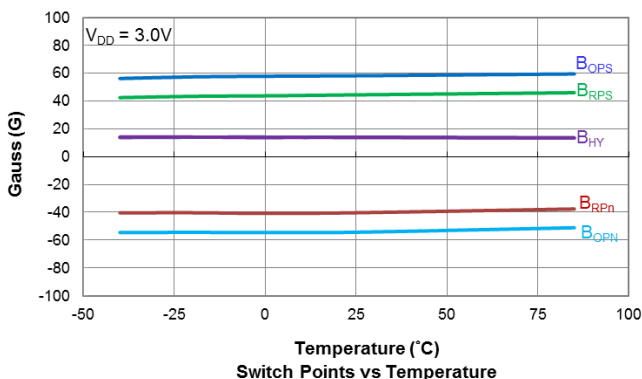
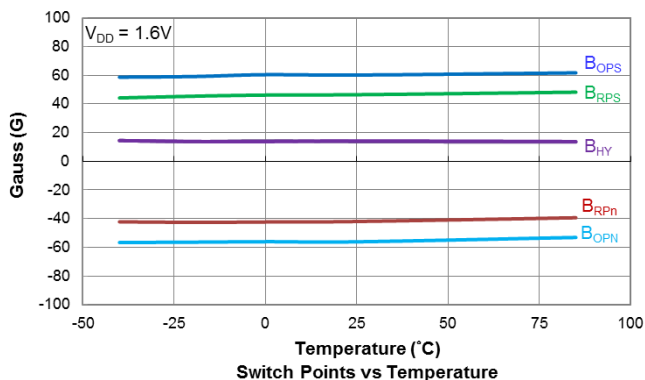
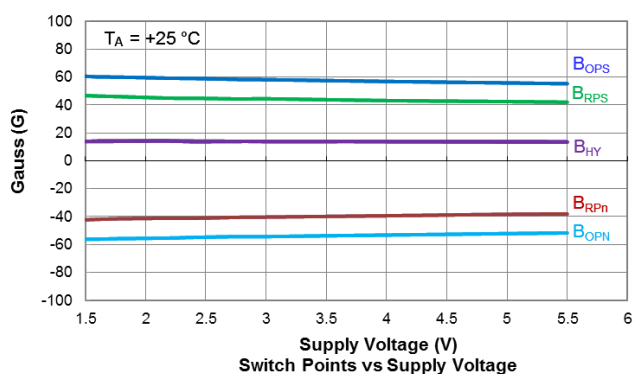
| Symbol | Characteristics | Test Condition | Min | Typ | Max | Unit |
|---|-----------------|---|-----|-----|-----|-------|
| B_{OPS} (South Pole to the Non-Part Marking Side) | Operation Point | $V_{DD} = 1.6\text{V}$ to 5.5V $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 30 | 60 | 90 | Gauss |
| B_{OPN} (North Pole to the Non-Part Marking Side) | | $V_{DD} = 1.6\text{V}$ to 5.5V $T_A = -40^{\circ}\text{C}$ 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 5.5V $T_A = -40^{\circ}\text{C}$ 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 5.5V $T_A = -40^{\circ}\text{C}$ 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.

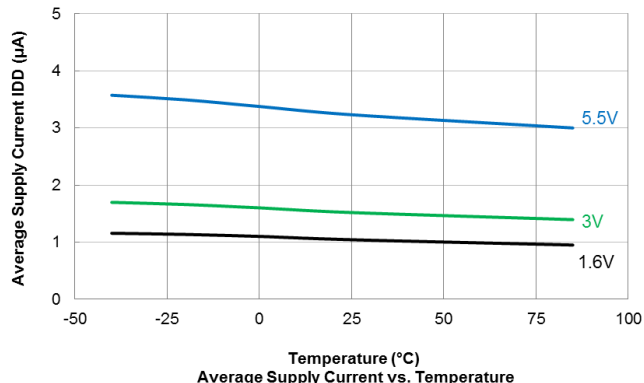
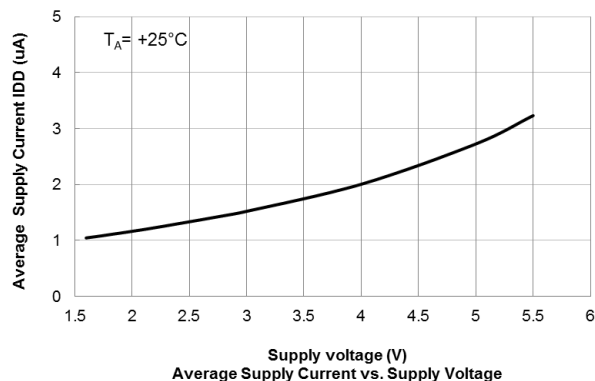


Typical Operating Characteristics

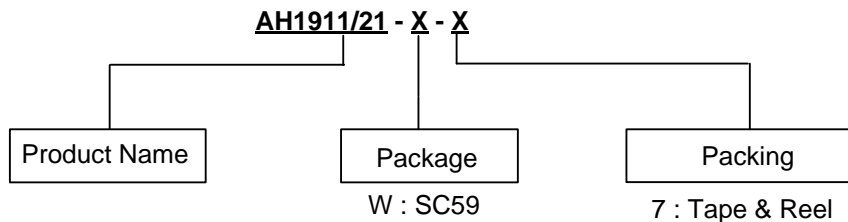
Output Switch Operate and Release Points (Magnetic Thresholds)



Average Supply Current



Ordering Information

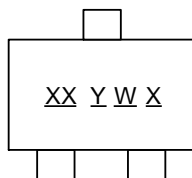


| Part Number | Package Code | Packaging | 7" Tape and Reel | |
|-------------|--------------|-----------|------------------|--------------------|
| | | | Quantity | Part Number Suffix |
| AH1911-W-7 | W | SC59 | 3000/Tape & Reel | -7 |
| AH1921-W-7 | W | SC59 | 3000/Tape & Reel | -7 |

Marking Information

(1) Package Type: SC59

(Top View)



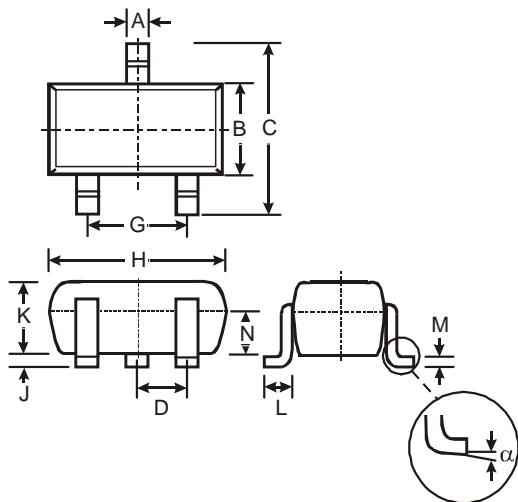
XX : Identification Code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
 a to z : 27 to 52 week; z represents
 52 and 53 week
X : Internal Code

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

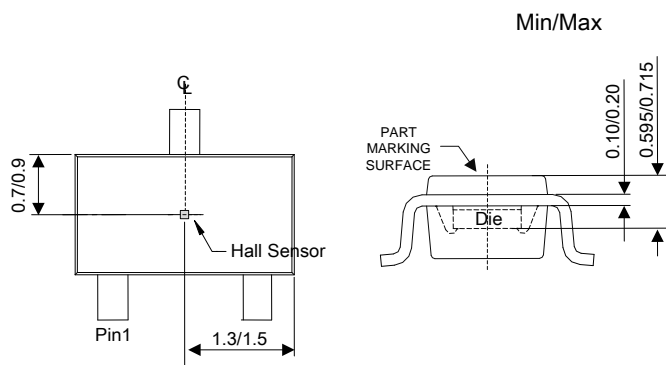
Package Outline Dimensions (All dimensions in mm.)

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 | | | |

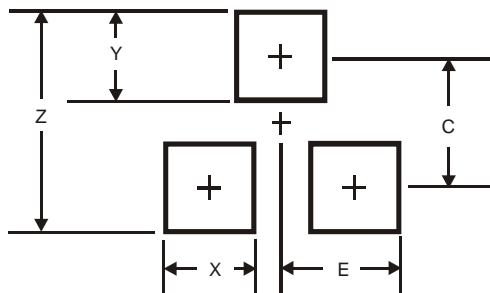


Sensor Location

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 |

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