

## Description

AH1889 is a high sensitivity dual output Unipolar Hall effect IC which can detect either a North or South pole independently and switch one of its two outputs with internal pull up and pull down capability. The AH1889 is mainly designed for low voltage applications which require a quick response time and can operate over the supply voltage of 1.65V to 3.6V. To minimize PCB space AH1889 outputs have internal pull up and pull down capability and is packaged in a small low profile SOT553 package.

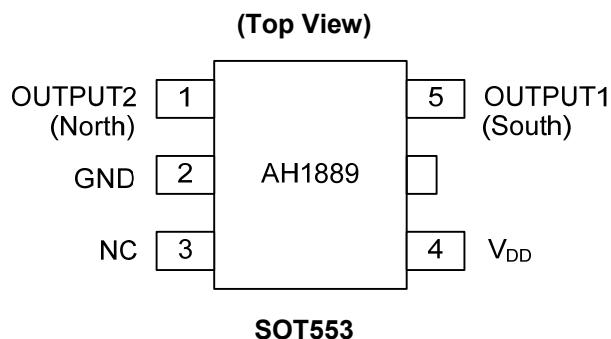
A South pole of sufficient strength will turn OUTPUT1 on and a North pole of sufficient strength will turn on OUTPUT2. While the magnetic flux density (B) perpendicular to the package is larger than operate point Bops or Bopn, the appropriate output will be turned on (pulled low), the output is held until B is lower than release point Brps or Brpn, then turned off (high). The outputs will be turned off and will remain off when there is no magnetic field.

## Features

- Two Monolithic Unipolar Hall Effect Sensor Switch
  - Operation with a South Pole (OUTPUT1)
  - Operation with a North Pole (OUTPUT2)
- Supply Voltage of 1.65V to 3.6V
- Quick Response Time Without Sleep Mode
- Chopper Stabilized Design Provides:
  - Superior Temperature Stability
  - Extremely low Switch-Point Drift
  - Enhanced immunity to physical stress
- Good RF Noise Immunity
- 40°C to +85°C Operating Temperature
- ESD (Human Body Model) >4kV
- Small and Low Profile SOT553 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) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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.

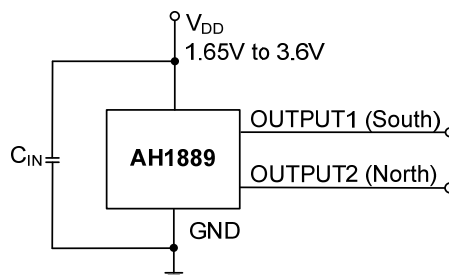
## Pin Assignments



## Applications

- Position and proximity detection for consumer, office equipments and industrial applications
- Open and close detect switches for home appliances
- Door, lids, tray position detect switches
- Magnetic field direction detection
- Contact-less switches for consumer and industrial applications

## Typical Applications Circuit



- Note: 4. C<sub>IN</sub> is for power stabilization and to strengthen the noise immunity, the recommended capacitance 100nF typical.

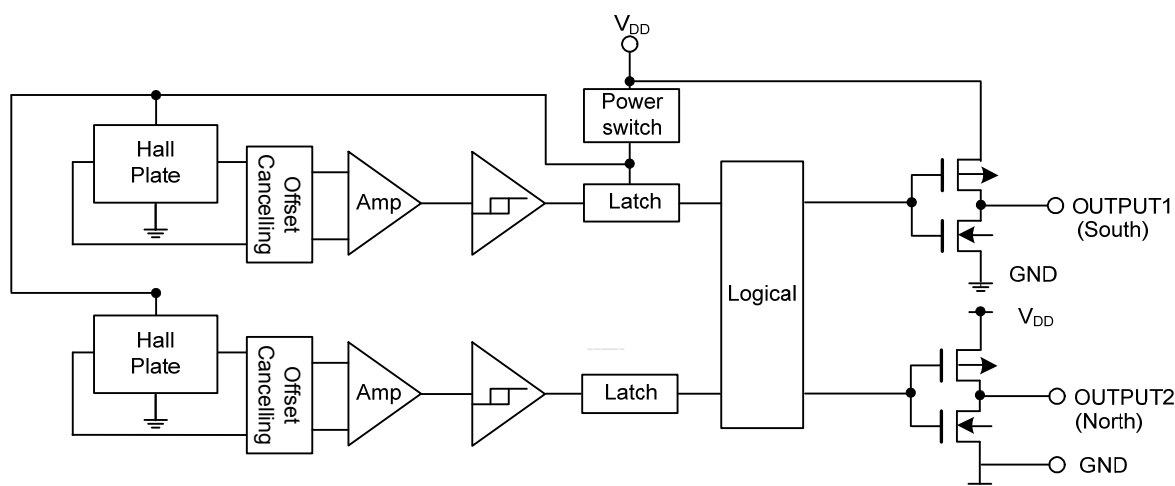
## Pin Descriptions

Package: SOT553

| Pin Number | Pin Name        | Function                                     |
|------------|-----------------|--|
| 1          | OUTPUT2         | North Pole Selecting Output Pin (active low) |
| 2          | GND             | Ground                                       |
| 3          | NC              | No Connection (Note 5)                       |
| 4          | V <sub>DD</sub> | Power Supply Voltage                         |
| 5          | OUTPUT1         | South Pole Detecting Output Pin (active low) |

Note: 5. NC is "No Connection" pin and is not connected internally. This pin can be left open or tied to ground.

## Functional Block Diagram



## Absolute Maximum Ratings (Note 6) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Symbol              | Characteristics                  | Values      | Unit |
|---------------------|----------------------------------|-------------|------|
| V <sub>DD</sub>     | Supply Voltage (Note 7)          | 5           | 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        | SOT553      | 230  |
| T <sub>s</sub>      | Storage Temperature Range        | -65 to +150 | °C   |
| T <sub>J</sub>      | Maximum Junction Temperature     | 150         | °C   |
| ESD                 | Human Body Model ESD capability  | 4           | kV   |

Notes: 6. 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.  
7. 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          | Characteristic              | Conditions | Rating      | Unit |
|-----------------|-----------------------------|------------|-------------|------|
| V <sub>DD</sub> | Supply Voltage              | Operating  | 1.65 to 3.6 | V    |
| T <sub>A</sub>  | Operating Temperature Range | Operating  | -40 to +85  | °C   |

## Electrical Characteristics (Note 8) (@T<sub>A</sub> = +25°C, V<sub>DD</sub> = 1.8V, unless otherwise specified.)

| Symbol          | Characteristic                         | Conditions                         | Min                   | Typ | Max | Unit |
|-----------------|--|------------------------------------|-----------------------|-----|-----|------|
| V <sub>OH</sub> | OUTPUT1 and OUTPUT2 High Voltage (off) | I <sub>OUT</sub> = -0.5mA          | V <sub>DD</sub> - 0.2 | —   | —   | V    |
| V <sub>OL</sub> | OUTPUT1 and OUTPUT2 Low Voltage (on)   | I <sub>OUT</sub> = 0.5mA           | —                     | 0.1 | 0.2 | V    |
| I <sub>DD</sub> | Supply Current                         | V <sub>DD</sub> = 1.8V Outputs Off | —                     | 2.1 | —   | mA   |
|                 |  | V <sub>DD</sub> = 3.6V Outputs Off | —                     | 5   | —   | mA   |

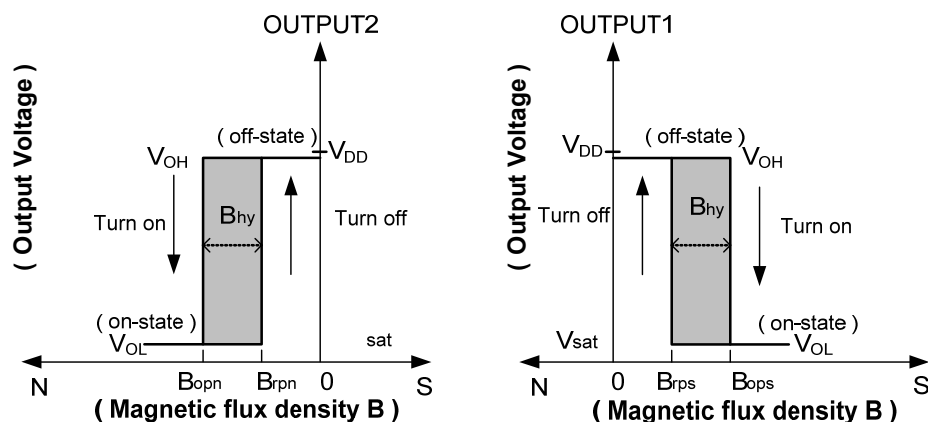
Note: 8. When power is initially turned on, the operating V<sub>DD</sub> (1.65V to 3.6V) must be applied to guaranteed the output.

## Magnetic Characteristics (Note 9, 10, 11) (@T<sub>A</sub> = +25°C, V<sub>DD</sub> = 1.8V, unless otherwise specified.)

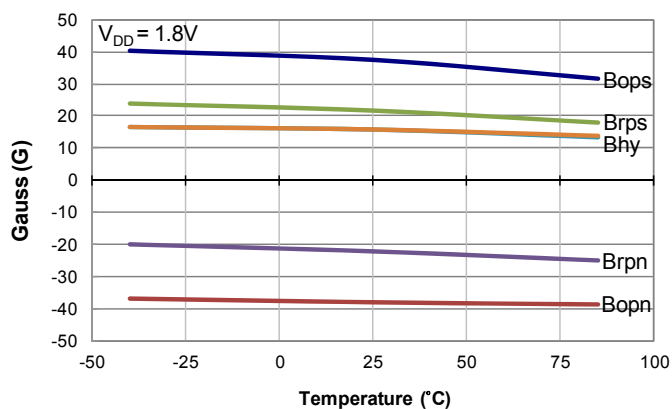
(1mT=10 Gauss)

| Output  | Symbol                                 | Characteristic  | Min | Typ | Max | Unit  |
|---------|--|-----------------|-----|-----|-----|-------|
| OUTPUT1 | Bops (South pole to part marking side) | Operation Point | —   | 35  | 50  | Gauss |
|         | Brps (South pole to part marking side) | Release point   | 6   | 20  | —   |       |
| OUTPUT2 | Bopn (North pole to part marking side) | Operation Point | -50 | -35 | —   |       |
|         | Brpn (North pole to part marking side) | Release point   | —   | -20 | -6  |       |
|         | Bhy ( Bopx - Brpx )                    | Hysteresis      | —   | 8   | —   |       |

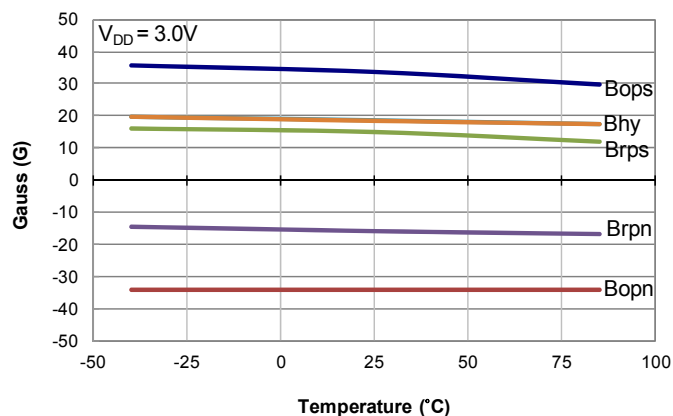
Notes: 9. Typical data is at T<sub>A</sub> = +25°C, V<sub>DD</sub> = 3V, and for design information only.  
10. Bops and Brps for OUTPUT1 pin responds to South pole only; Bopn and Brpn for OUTPUT2 pin responds to North pole only.  
11. Magnetic characteristics may vary with operating temperature and after soldering.



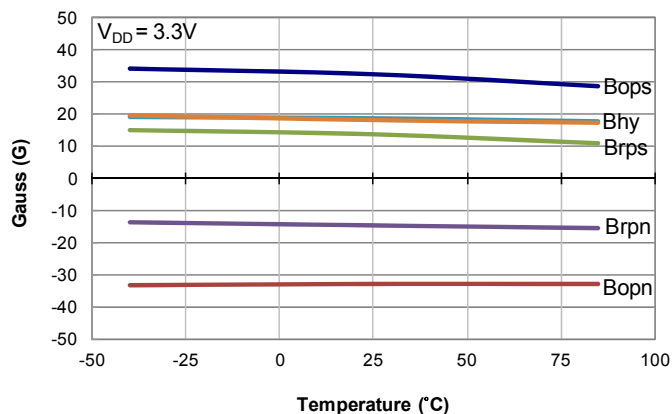
## Typical Operating Characteristics



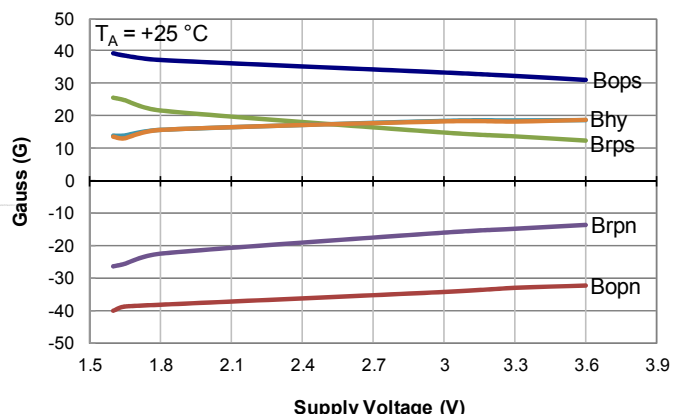
Switch Points vs Temperature



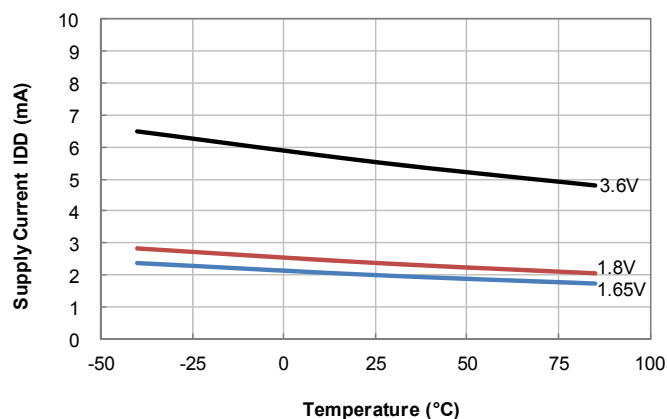
Switch Points vs Temperature



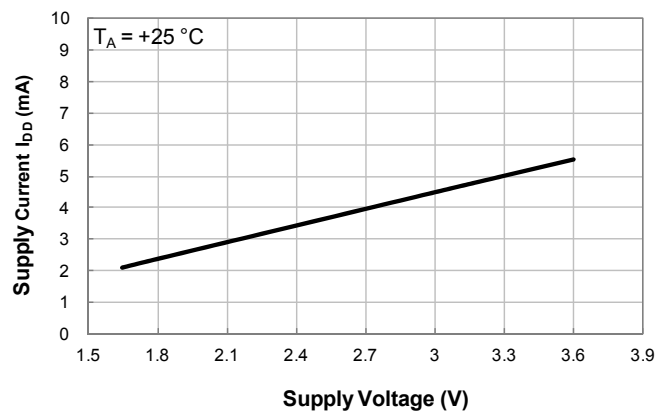
Switch Points vs Temperature



Switch Points vs Supply Voltage



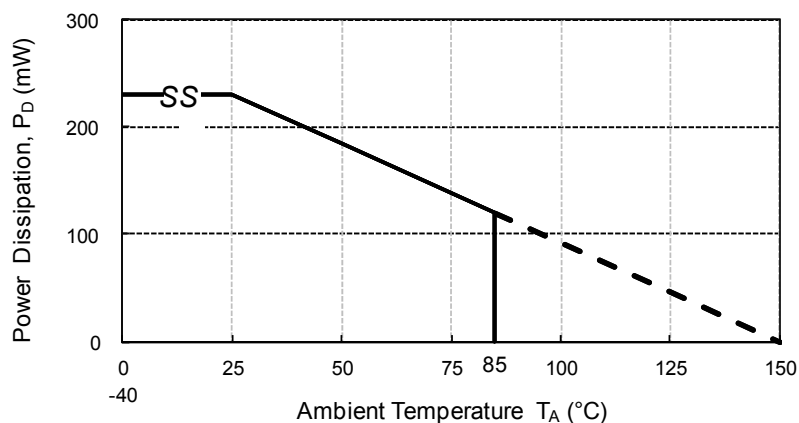
Supply Current vs. Temperature



Supply Current vs. Supply Voltage

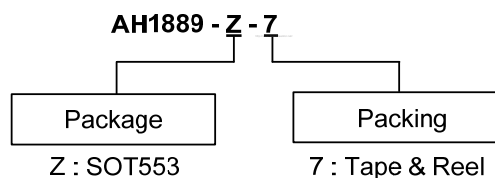
## Thermal Performance Characteristics

| T <sub>A</sub> (°C) | 25  | 50  | 60  | 70  | 80  | 85  | 90  | 100 | 110 | 120 | 130 | 140 | 150 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| P <sub>D</sub> (mW) | 230 | 184 | 166 | 147 | 129 | 120 | 110 | 92  | 74  | 55  | 37  | 18  | 0   |



Power Dissipation Curve

## Ordering Information

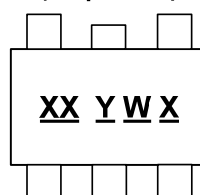


| Part Number | Package Code | Packaging | 7" Tape and Reel |                    |
|-------------|--------------|-----------|------------------|--------------------|
|             |              |           | Quantity         | Part Number Suffix |
| AH1889-Z-7  | Z            | SOT553    | 3000/Tape & Reel | -7                 |

## Marking Information

(1) Package Type: SOT553

( Top View )



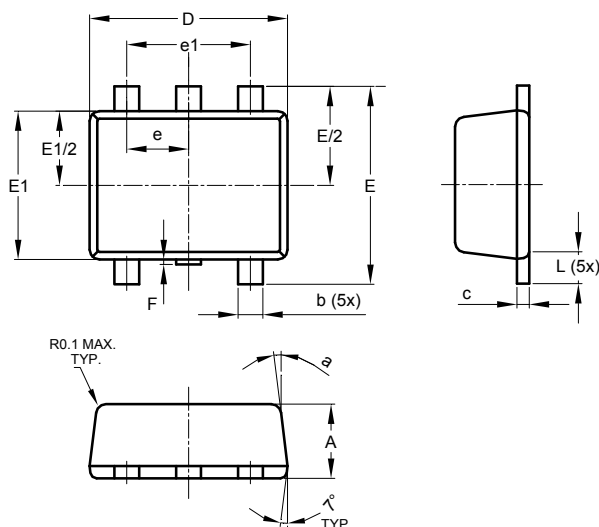
XX : Identification Code  
Y : Year : 0 to 9  
W : Week : A to Z : 1~26 week;  
           a to z : 27~52 week; z represents  
           52 and 53 week  
X : Internal code

| Part Number | Package | Identification Code |
|-------------|---------|---------------------|
| AH1889      | SOT553  | KX                  |

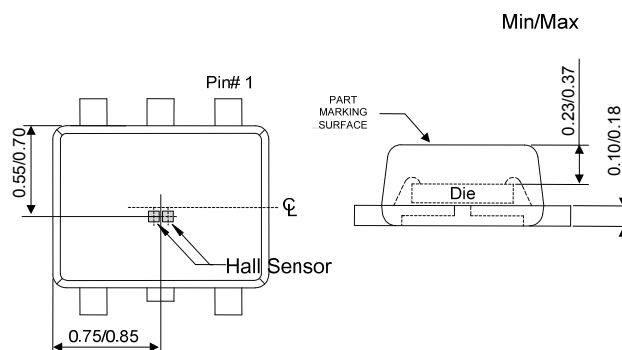
## Package Outline Dimensions (All dimensions in mm.)

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

### (1) Package Type: SOT553



| SOT553               |          |      |      |
|----------------------|----------|------|------|
| Dim                  | Min      | Max  | Typ  |
| A                    | 0.55     | 0.62 | 0.60 |
| b                    | 0.15     | 0.30 | 0.20 |
| c                    | 0.10     | 0.18 | 0.15 |
| D                    | 1.50     | 1.70 | 1.60 |
| E                    | 1.55     | 1.70 | 1.60 |
| E1                   | 1.10     | 1.25 | 1.20 |
| e                    | 0.50 BSC |      |      |
| e1                   | 1.00 BSC |      |      |
| F                    | 0.00     | 0.10 | —    |
| L                    | 0.10     | 0.30 | 0.20 |
| a                    | 6°       | 8°   | 7°   |
| All Dimensions in mm |          |      |      |

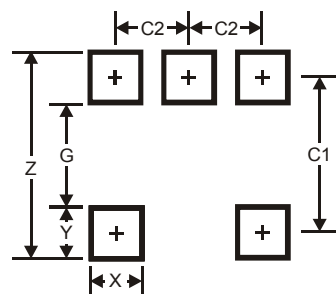


Sensor Location

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### (1) Package Type: SOT553



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 2.2           |
| G          | 1.2           |
| X          | 0.375         |
| Y          | 0.5           |
| C1         | 1.7           |
| C2         | 0.5           |

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