

### Description

The AH1892 is a micropower magnetic range selectable (Bop/Brp) Omnipolar Hall effect switch IC with internal pull up and pull down capability, designed for consumer equipment ranging from portable and battery powered cellular phones and portable PCs to home appliances and industrial applications. To support battery powered equipment and low voltage microcontrollers, the AH1892 can operate over the supply range of 1.6V to 3.6V and uses a hibernating clocking system to minimize the power consumption. The average supply current is only 4.3µA typical at 1.80V. Due to the application diversity, the AH1892 has an 8kV ESD rating on the supply and output pins. To minimize PCB space the AH1892 is packaged in the small CSP package (0.71mm x 0.71mm) or SOT553 leaded package

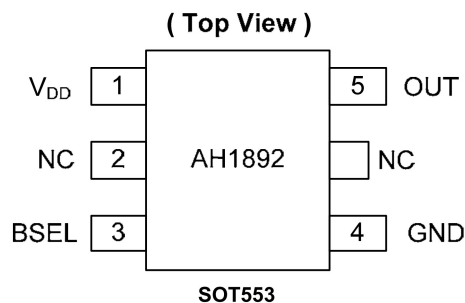
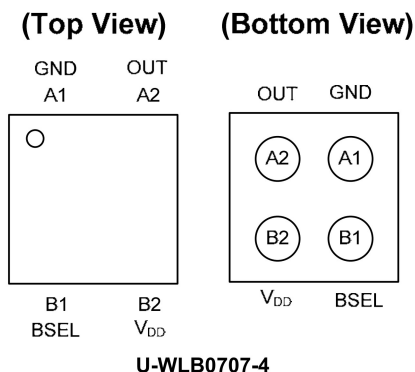
The output is activated with either a north or south pole of sufficient magnetic field strength. The user can select one of two magnetic sensitivity bands via the BSEL pin without the addition of any external components allowing a flexible but small solution. The band select can be hardwired or be changed on the fly via a logic source such as a micro-controller. When the magnetic flux density (**B**) is larger than operate point (**Bop**), the output will be turned on (pulled low) and held until **B** is lower than release point (**Brp**).

### Features

- Omnipolar operation (North or South pole)
- Programmable operate and release points
- Supply voltage of 1.6V to 3.6V
- Micropower operation
- Chopper stabilized design
  - Superior temperature stability
  - Extremely Low Switch-Point Drift
  - Insensitive to Physical Stress
- No external pull up resistors required
- Good RF noise immunity
- -40°C to +85°C operating temperature
- 8kV ESD on supply and output pins
- Miniature U-WLB07070-4 (CSP 0.71mm x 0.71mm typical) and small low profile SOT553
- **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> 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.

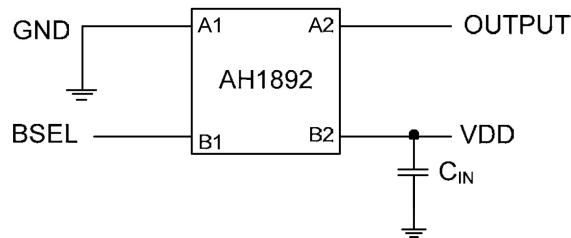
### Pin Assignments



### Applications

- Open and close detect for gaming and cellular phones
- Holster and dock detect for cellular phones
- Cover switch in portable and tablet PCs
- Digital still and video cameras
- Tray, door and covers position detect for printers and scanners
- Contact-less switch in consumer and industrial products

### Typical Application Circuit



Note :  $C_{IN}$  is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 100nF typical

### Pin Descriptions

Package: U-WLB0707-4

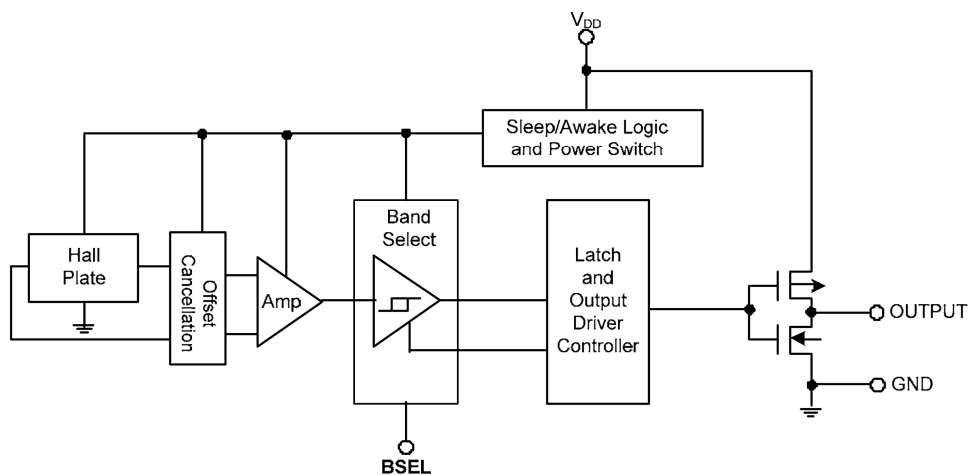
| Pin # | Pin Name        | Description          |
|-------|-----------------|----------------------|
| A1    | GND             | Ground               |
| A2    | OUTPUT          | Output               |
| B1    | BSEL            | Band Select          |
| B2    | V <sub>DD</sub> | Power Supply Voltage |

Package: SOT553

| Pin # | Pin Name        | Description            |
|-------|-----------------|------------------------|
| 1     | V <sub>DD</sub> | Power Supply Voltage   |
| 2     | NC              | No Connection (Note 4) |
| 3     | BSEL            | Band Select            |
| 4     | GND             | Ground                 |
| 5     | OUTPUT          | Output                 |

Notes: 4. NC is "No Connection" pin and is not connected internally. This pin can be left open or connected to ground.

### Functional Block Diagram



### Absolute Maximum Ratings ( $T_A = +25^\circ\text{C}$ , Note 5)

| Symbol              | Characteristics                  | Values                      | Unit             |
|---------------------|----------------------------------|-----------------------------|------------------|
| $V_{DD}$            | Supply Voltage (Note 6)          | 6                           | V                |
| $V_{DD\text{ REV}}$ | Reverse Supply Voltage           | -0.3                        | V                |
| $I_{\text{OUTPUT}}$ | Output current (source and sink) | 2.5                         | mA               |
| B                   | Magnetic Flux Density            | Unlimited                   |                  |
| $T_s$               | Storage Temperature Range        | -65 to +150                 | $^\circ\text{C}$ |
| $P_D$               | Package Power Dissipation        | U-WLB0707-4                 | 160 mW           |
|                     |                                  | SOT553                      | 230 mW           |
| $T_J$               | Maximum Junction Temperature     | 150                         | $^\circ\text{C}$ |
| ESD                 | Human Body Model ESD             | $V_{DD}$ , GND and OUT pins | 8 kV             |
|                     |                                  | BSEL pin                    | 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

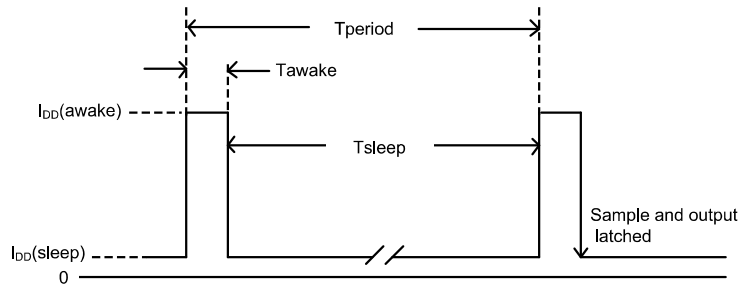
| Symbol   | Characteristics             | Conditions | Rating     | Unit             |
|----------|-----------------------------|------------|------------|------------------|
| $V_{DD}$ | Supply Voltage              | Operating  | 1.6 to 3.6 | V                |
| $T_A$    | Operating Temperature Range | Operating  | -40 to +85 | $^\circ\text{C}$ |

### Electrical Characteristics ( $T_A = +25^\circ\text{C}$ , $V_{DD} = 1.8\text{V}$ , unless otherwise specified.)

| Symbol                 | Characteristics                    | Conditions                     | Min            | Typ            | Max   | Unit          |
|------------------------|------------------------------------|--------------------------------|----------------|----------------|-------|---------------|
| $V_{OL}$               | Output low voltage (on)            | $I_{\text{OUT}} = 1\text{mA}$  |                | 0.1            | 0.2   | V             |
| $V_{OH}$               | Output high voltage (off)          | $I_{\text{OUT}} = -1\text{mA}$ | $V_{DD} - 0.2$ | $V_{DD} - 0.1$ |       | V             |
| BLsel                  | Band select low band               |                                | 0              |                | 0.5   | V             |
| BHsel                  | Band select high band              |                                | 1.4            |                | 3.6   | V             |
| $R_{U\_BSEL}$          | BSEL pin internal pull-up resistor | (Note 7)                       |                | 50             |       | k $\Omega$    |
| $I_{DD}(\text{awake})$ | Supply current                     | During 'awake' period          |                | 2.1            |       | mA            |
| $I_{DD}(\text{sleep})$ |                                    | During 'sleep' period          |                | 2.5            |       | $\mu\text{A}$ |
| $I_{DD}(\text{avg})$   | Average supply current             | $V_{DD} = 1.8\text{V}$         |                | 4.3            | 8.0   | $\mu\text{A}$ |
| $I_{DD}(\text{avg})$   |                                    | $V_{DD} = 3.6\text{V}$         |                | 7.2            | 13.0  | $\mu\text{A}$ |
| $T_{\text{awake}}$     | Awake active pulse width           | (Note 8)                       |                | 50             | 100   | $\mu\text{s}$ |
| $T_{\text{period}}$    | Awake period                       | (Note 8)                       |                | 50             | 100   | ms            |
| D.C.                   | Duty cycle                         |                                |                | 0.1            |       | %             |
| $T_{\text{Band}}$      | Band transition time               | (Note 9)                       |                | 100.0          | 200.1 | ms            |

- Notes:
- BSEL pin internal pull-up resistor is only active during AWAKE time.
  - When power is initially on, the operating  $V_{DD}$  (1.6V to 3.6V) must be applied to guarantee the output sampling. The output state is valid after the second operating phase (typical 100ms).
  - Transition time varies dependant on the timing of BSEL activation during the sleep and awake phases.

**Electrical Characteristics (cont.)**



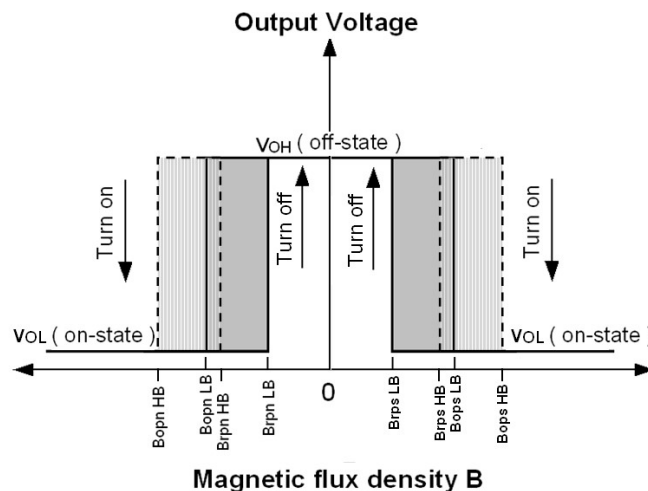
**Magnetic Characteristics ( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 1.6\text{V to } 3.6\text{V}$ , Note 10)**

(1mT=10 Gauss)

| BSEL | Symbol  | Characteristics             | Min | Typ | Max | Unit  |
|------|---|-----------------------------|-----|-----|-----|-------|
| Low  | Bops <sub>LB</sub> (south pole to brand side) | Low Band - Operation Point  | 18  | 35  | 55  | Gauss |
| Low  | Bopn <sub>LB</sub> (north pole to brand side) |                             | -55 | -35 | -18 |       |
| Low  | Brps <sub>LB</sub> (south pole to brand side) | Low Band - Release Point    | 12  | 25  | 45  |       |
| Low  | Brpn <sub>LB</sub> (north pole to brand side) |                             | -45 | -25 | -12 |       |
| High | Bops <sub>HB</sub> (south pole to brand side) | High Band - Operation Point | 43  | 60  | 80  |       |
| High | Bopn <sub>HB</sub> (north pole to brand side) |                             | -80 | -60 | -43 |       |
| High | Brps <sub>HB</sub> (south pole to brand side) | High Band - Release Point   | 35  | 50  | 70  |       |
| High | Brpn <sub>HB</sub> (north pole to brand side) |                             | -70 | -50 | -35 |       |
| -    | Bhy ( $ B_{opx}  -  B_{rpx} $ )               | Hysteresis                  | -   | 10  | -   |       |

Notes: 10. Magnetic characteristics may vary with operating temperature and after soldering.

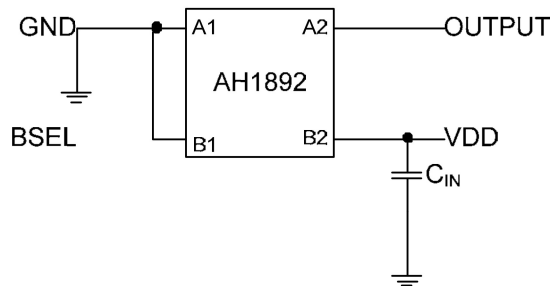
The AH1892 includes a band select pin (BSEL) so that the operate (Bops and Bopn) and release (Brps and Brpn) points can be adjusted between two pre-defined ranges. The BSEL can be hard wired within the application circuit or the band can be selected on the fly by using the BSEL pin as a logic input. This feature allows the AH1892 sensitivity to be changed by firmware within the application without the addition of any external components. If the BSEL pin is left open circuit the AH1892 defaults to high band.



**Application Note**

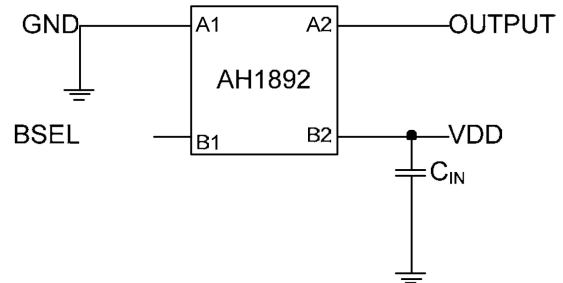
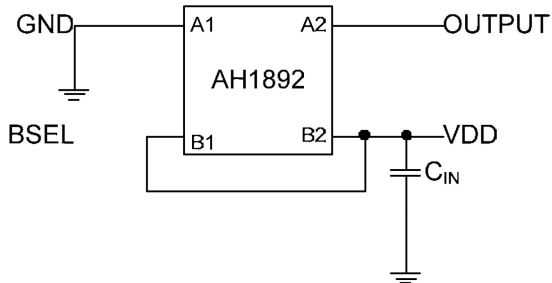
**Applications Circuit One – Low Band**

Connecting the BSEL pin to ground permanently configures the AH1892 into its high sensitivity mode, requiring a reduced magnetic flux density to activate its output (Low Band).



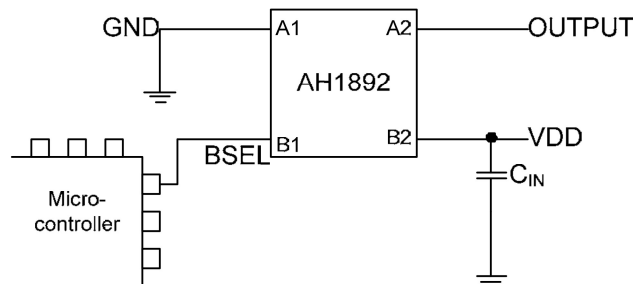
**Applications Circuit Two – High Band**

Connecting the BSEL pin to Vdd or to a voltage greater than 1.4V or leaving the BSEL pin unconnected configures the AH1892 into its low sensitivity mode, requiring a higher magnetic flux density to activate its output (High Band).



**Applications Circuit Three – Adjustable Sensitivity**

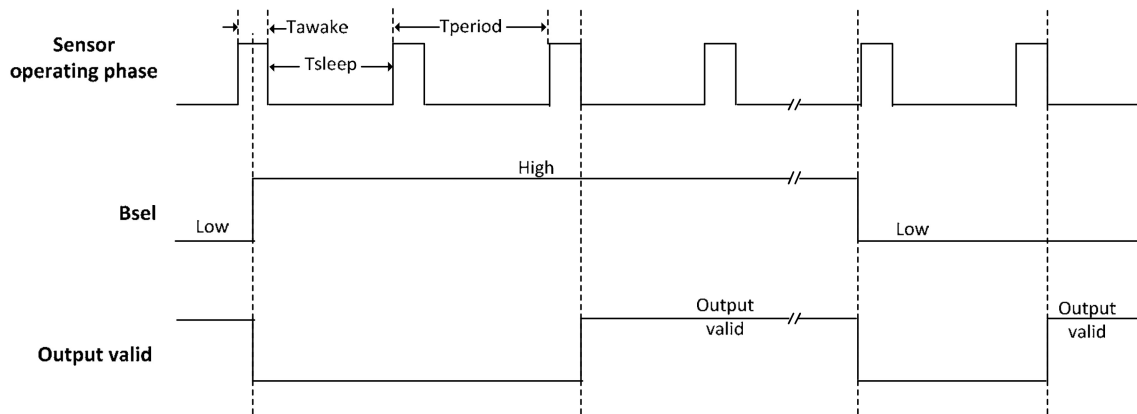
To enhance flexibility within the application, the sensitivity can be adjusted with a standard logic signal allowing it to be controlled by a micro-controller or a logic source. This allows the sensitivity to be changed within the application without a hardware change. Whenever the sensitivity band selection is changed, the band selection changeover should be allowed to complete for the output to be valid.



**Application Note (cont.)**

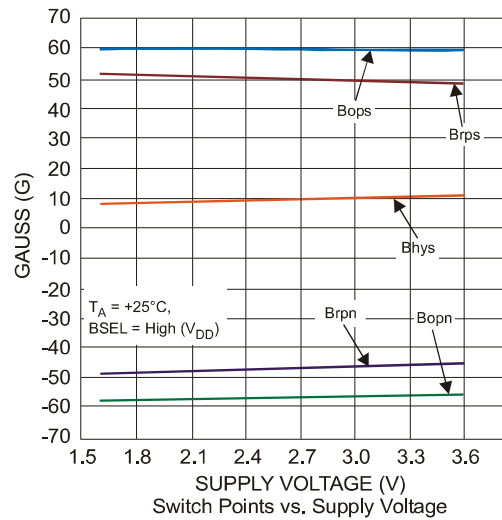
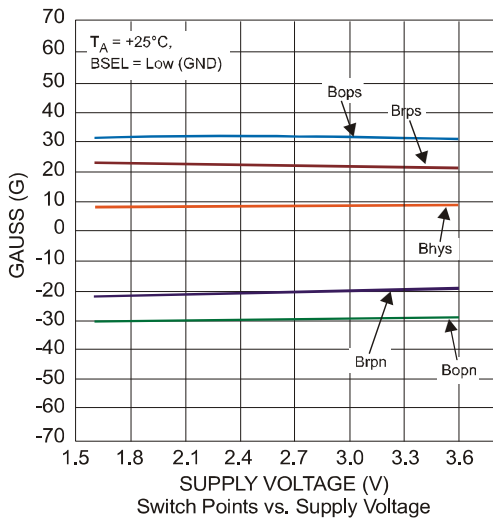
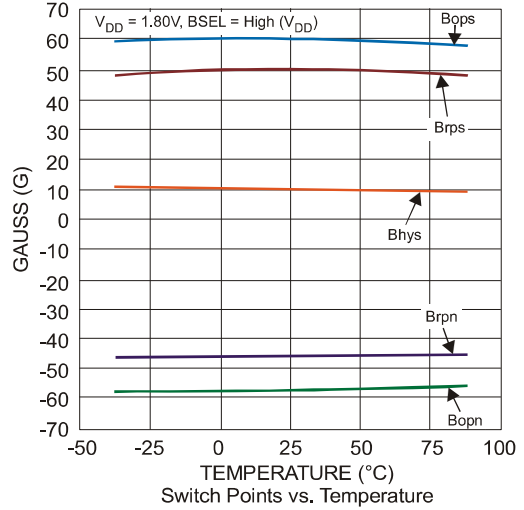
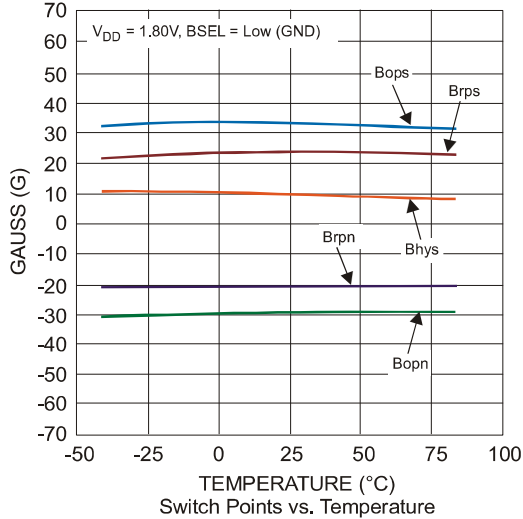
**Bands Select Change Timing and Valid Output**

Whenever band selection BSEL pin input is changed, allow for band selection changeover to complete and stabilize. The output is valid only after the second complete operating 'awake' phase. Time taken for the output to be valid, after the BSEL change, depends on timing of BSEL change during the sleep and awake phase; this time can range from 100ms typical and 200.1ms maximum.

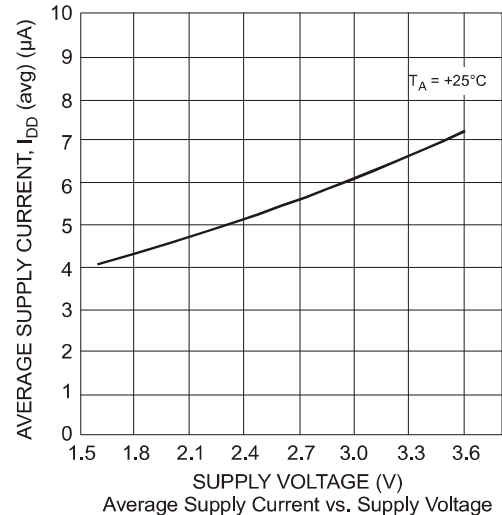
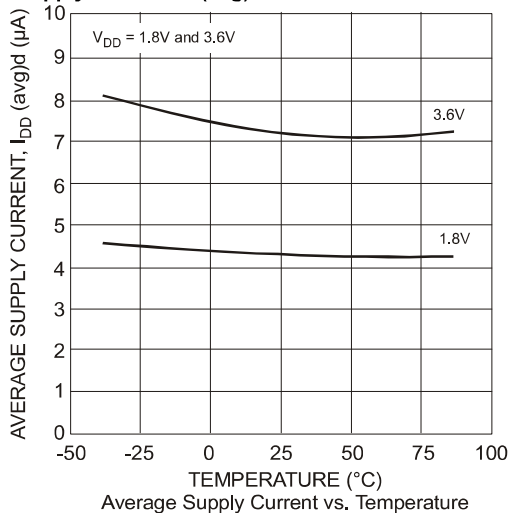


**Typical Operating Characteristics**

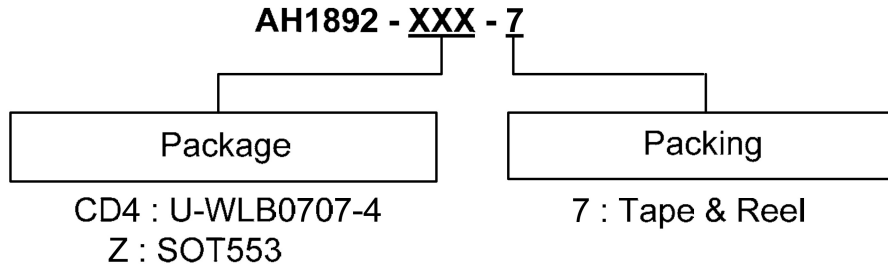
Typical switch points characteristics in low band (BSEL = Low) and high band (BSEL = High)



**Average Supply Current  $I_{DD}(avg)$**



**Ordering Information**

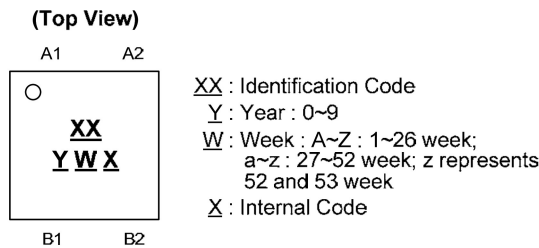


| Device       | Package Code | Packaging<br>(Note 11) | 7" Tape and Reel |                    |
|--------------|--------------|------------------------|------------------|--------------------|
|              |              |                        | Quantity         | Part Number Suffix |
| AH1892-CD4-7 | CD4          | U-WLB0707-4            | 3000/Tape & Reel | -7                 |
| AH1892-Z-7   | Z            | SOT553                 | 3000/Tape & Reel | -7                 |

Notes: 11. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

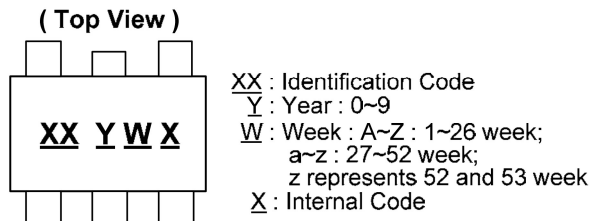
**Marking Information**

**(1) Package type: U-WLB0707-4**



| Part Number  | Package     | Identification Code |
|--------------|-------------|---------------------|
| AH1892-CD4-7 | U-WLB0707-4 | B2                  |

**(2) Package type: SOT553**



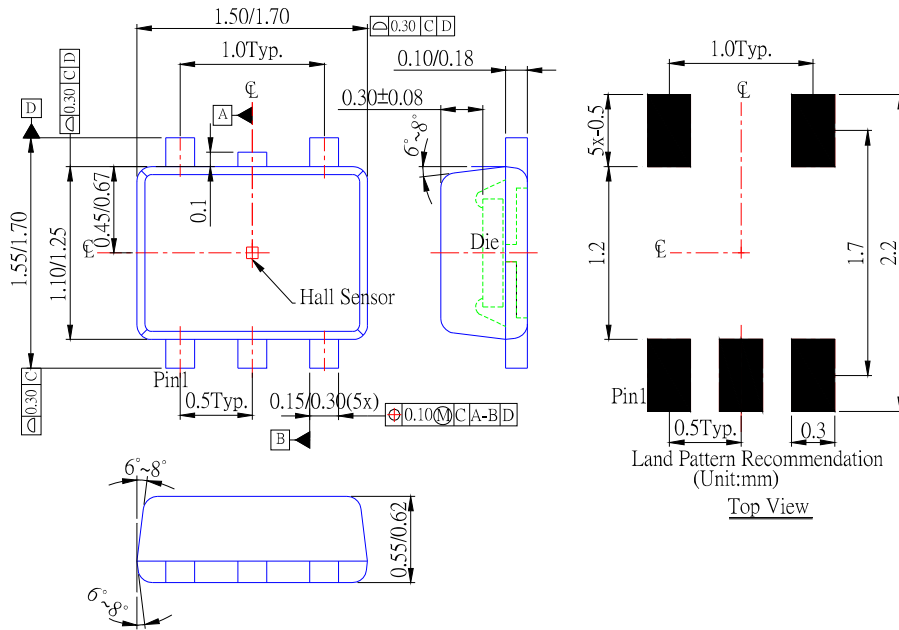
| Part Number | Package | Identification Code |
|-------------|---------|---------------------|
| AH1892-Z-7  | SOT553  | B2                  |





**Package Outline Dimensions (cont.)**

(2) Package type: SOT553



NEW PRODUCT

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