

**ULTRA LOW VOLTAGE HIGH-SENSITIVITY  
MICROPOWER OMNIPOLAR HALL-EFFECT SWITCH**

## Description

The AH1899S is a high-sensitivity micropower, Omnipolar Hall effect switch IC with internal pull-up and pull-down capability. Designed for portable and battery-powered equipment, such as cellular phones and portable PCs, the average supply current is only 5.1µA at 1.2V and 5.8µA at 1.8V. To support portable equipment, the AH1899S can operate over the supply range of 1.1V to 2.0V and uses a hibernating clocking system to minimize the power consumption. To minimize PCB space, the AH1899S is available in a small low profile X2-DFN1010-4 (Type B) package.

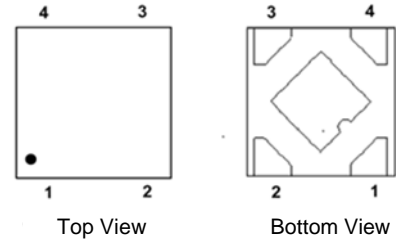
The output is activated with either a north or south pole of sufficient magnetic field strength. When the magnetic flux density (B) perpendicular to the package is larger than operate point (Bop), the output is turned on (pulled low). The output is turned off when B becomes lower than the release point (Brp). The output will remain off when there is no magnetic field.

## Features

- Omnipolar Operation (North or South Pole)
- Supply Voltage of 1.1V to 2.0V
- Micropower Operation
- Chopper Stabilized Design Provides:
  - Superior Temperature Stability
  - Minimal Switch Point Drift
  - Enhanced Immunity to Physical Stress
- No External Pull-Up Resistors Required
- Good RF Noise Immunity
- -40°C to +85°C Operating Temperature
- Small Low-Profile X2-DFN1010-4 (Type B) Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative.**  
<https://www.diodes.com/quality/product-definitions/>

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

## Pin Assignments



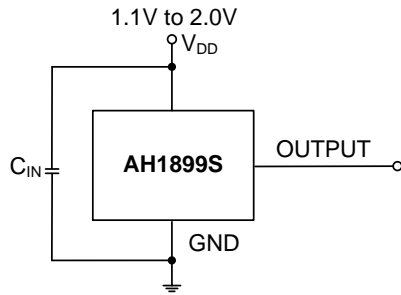
PIN1 – VDD, PIN2 – GND  
 PIN3 – NC, PIN4 – Output

**X2-DFN1010-4 (Type B)**

## Applications

- Covers or display switches in portable PCs
- Open and close detects for cellular phones
- Holsters or cover detects for cellular phones and tablet PCs
- Digital stills, Video cameras, and handheld gaming consoles
- Contactless switches

**Typical Applications Circuit**



Note: 4. C<sub>IN</sub> is for power stabilization and to strengthen the noise immunity. The recommended capacitance is 10nF to 100nF.

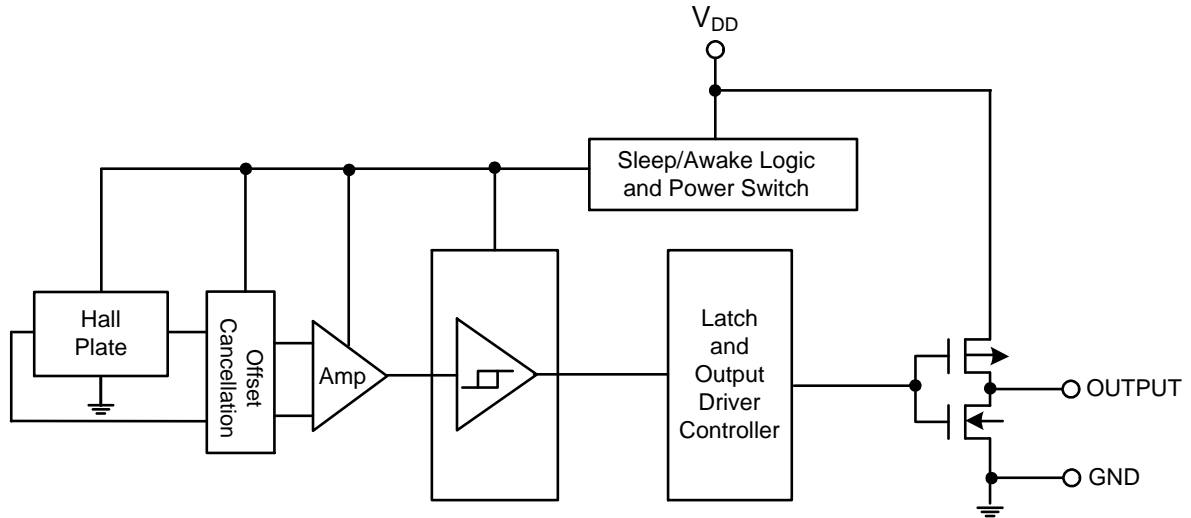
**Pin Descriptions**

Package: X2-DFN1010-4 (Type B)

Pin Number	Pin Name	Function
1	V <sub>DD</sub>	Power Supply Input
2	GND	Ground Pin
3	NC	No Connection (Note 5)
4	OUTPUT	Output Pin

Note: 5. NC is the *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	Parameter	Rating	Unit
V <sub>DD</sub>	Supply Voltage (Note 7)	2.2	V
V <sub>DD_REV</sub>	Reverse Supply Voltage	-0.3	V
I <sub>OUTPUT</sub>	Output Current (Source and Sink)	3	mA
B	Magnetic Flux Density	Unlimited	
P <sub>D</sub>	Package Power Dissipation	X2-DFN1010-4 (Type B)	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	8	kV

- Notes:
- Stresses greater than those listed under “*Absolute Maximum Ratings*” can cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “*Recommended Operating Conditions*” is not implied. Exposure to “*Absolute Maximum Ratings*” for extended periods can affect device reliability.
  - The absolute maximum V<sub>DD</sub> of 2.2V 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.

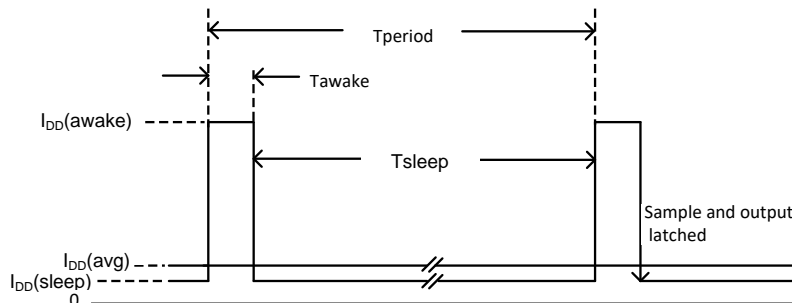
### Recommended Operating Conditions (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V <sub>DD</sub>	Supply Voltage	Operating	1.1 to 2.0	V
T <sub>A</sub>	Operating Temperature Range	Operating	-40 to +85	°C

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	Output Low Voltage (On)	I <sub>OUT</sub> = 0.5mA, V <sub>DD</sub> = 1.2V	—	0.1	0.2	V
V <sub>OH</sub>	Output High Voltage (Off)	I <sub>OUT</sub> = 0.5mA, V <sub>DD</sub> = 1.2V	V <sub>DD</sub> -0.2	V <sub>DD</sub> -0.1	—	V
I <sub>DD</sub> (awake)	Supply Current	During Awake Period, V <sub>DD</sub> = 1.2V	—	0.55	1.1	mA
		During Awake Period, V <sub>DD</sub> = 1.8V	—	0.68	1.4	mA
I <sub>DD</sub> (sleep)	Supply Current	During Sleep Period, V <sub>DD</sub> = 1.2V	—	0.29	0.6	µA
		During Sleep Period, V <sub>DD</sub> = 1.8V	—	0.35	0.7	µA
I <sub>DD</sub> (avg)	Average Supply Current	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 1.2V	—	5.1	9.5	µA
		T <sub>A</sub> = +25°C, V <sub>DD</sub> = 1.8V	—	5.8	11.5	µA
T <sub>AWAKE</sub>	Awake Time	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 1.2V (Note 8)	—	45	90	µs
T <sub>PERIOD</sub>	Period Time	T <sub>A</sub> = +25°C, V <sub>DD</sub> = 1.2V (Note 8)	—	5.6	11	ms
D.C.	Duty Cycle	—	—	0.8	—	%

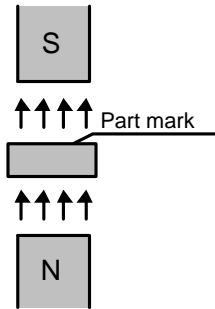
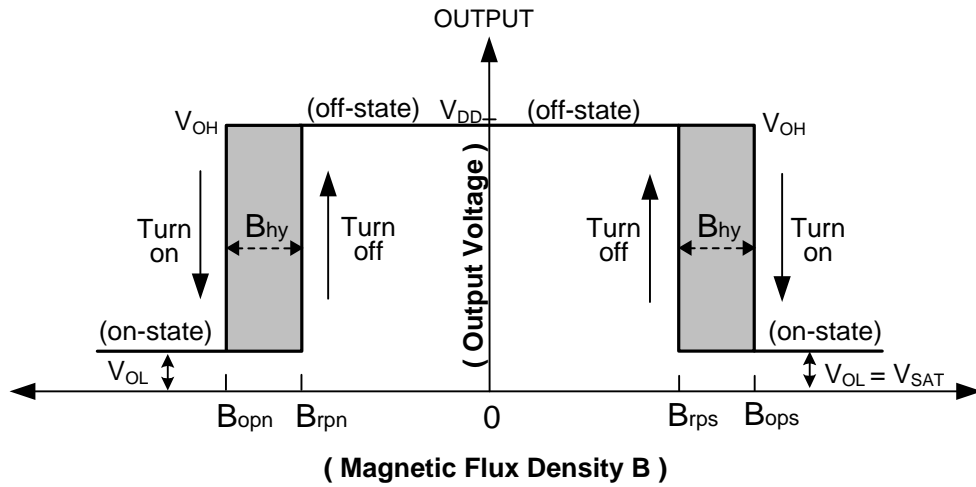
- Note: 8. When power is initially turned on, the operating V<sub>DD</sub> (1.1V to 2.0V) must be applied to guarantee the output sampling. The output state is valid after the second operating cycle (typical 11.2ms).



**Magnetic Characteristics** ( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 1.2\text{V}$ , unless otherwise specified.)

(1mT = 10 Gauss)

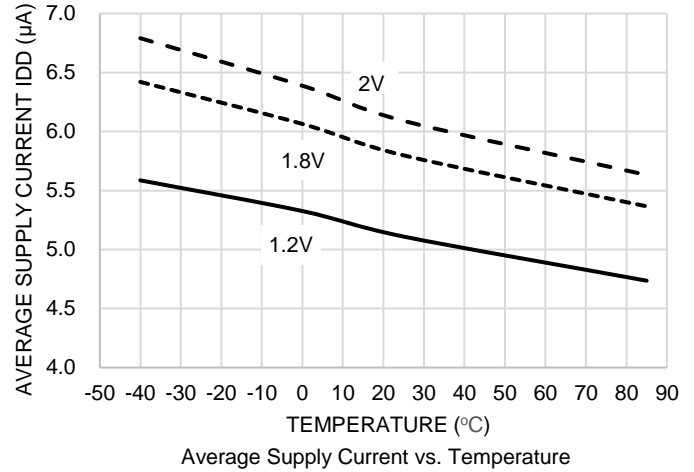
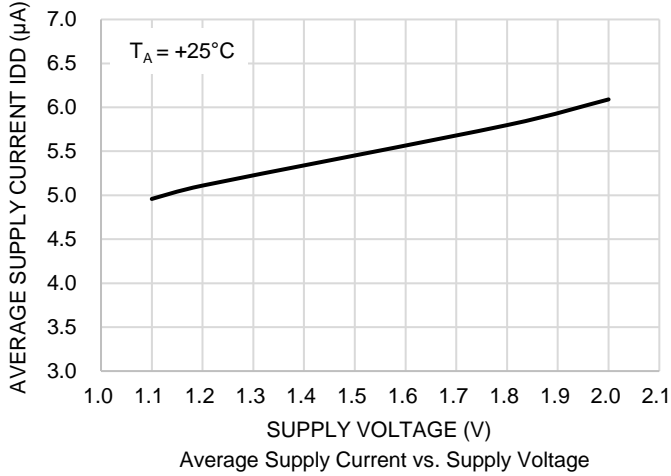
Symbol	Characteristics	Min	Typ	Max	Unit
Bops (South Pole to Part Marking Side)	Operation Point	20	30	40	Gauss
Bopn (North Pole to Part Marking Side)		-40	-30	-20	
Brps (South Pole to Part Marking Side)	Release Point	10	20	30	
Brpn (North Pole to Part Marking Side)		-30	-20	-10	
Bhy ( $ \text{Bopx}  -  \text{Brpx} $ )	Hysteresis	—	10	—	



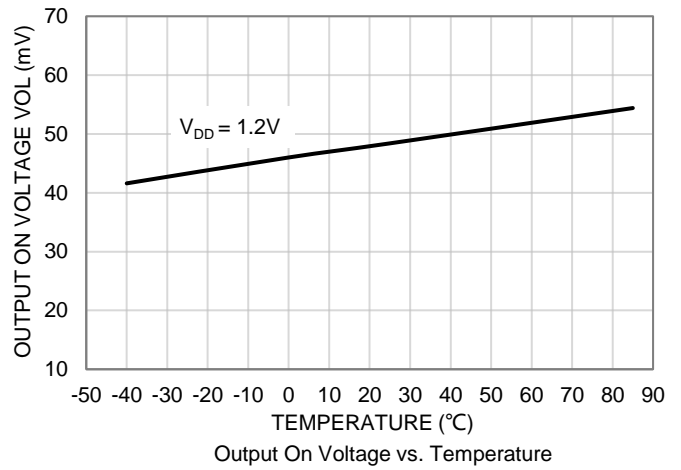
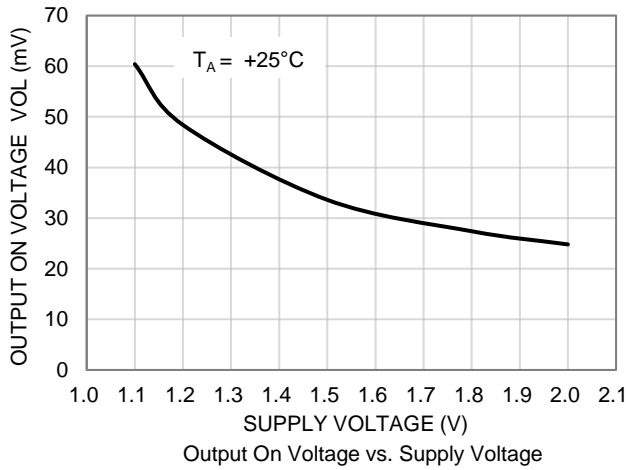
**X2-DFN1010-4 (Type B)**

**Typical Operating Characteristics**

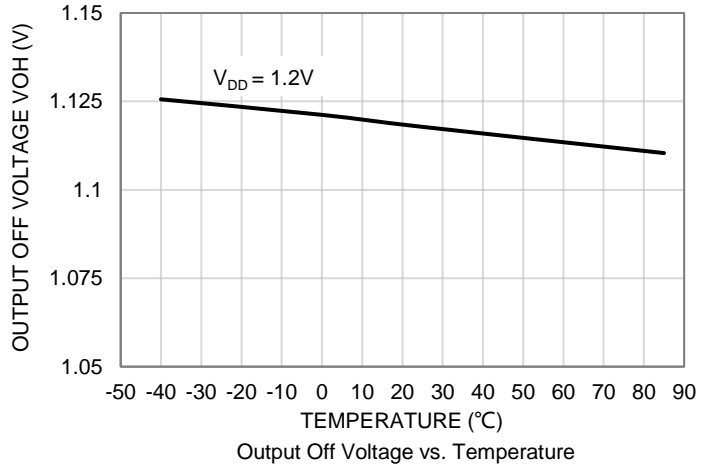
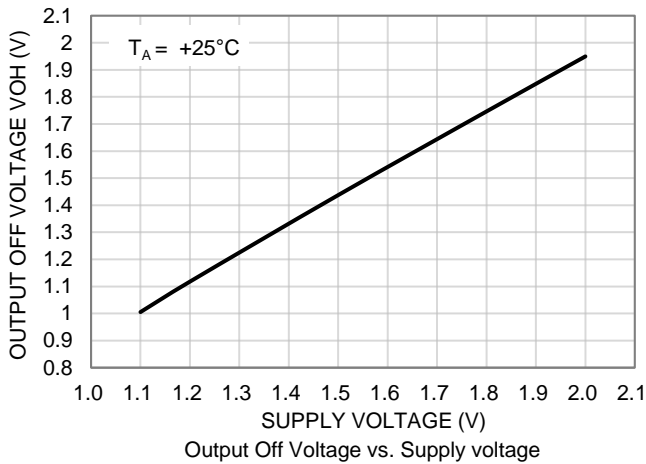
**Average Supply Current  $I_{DD(AVG)}$**



**Output Low Voltage (On)  $V_{OL}$ ,  $I_{OUT} = 0.5mA$**

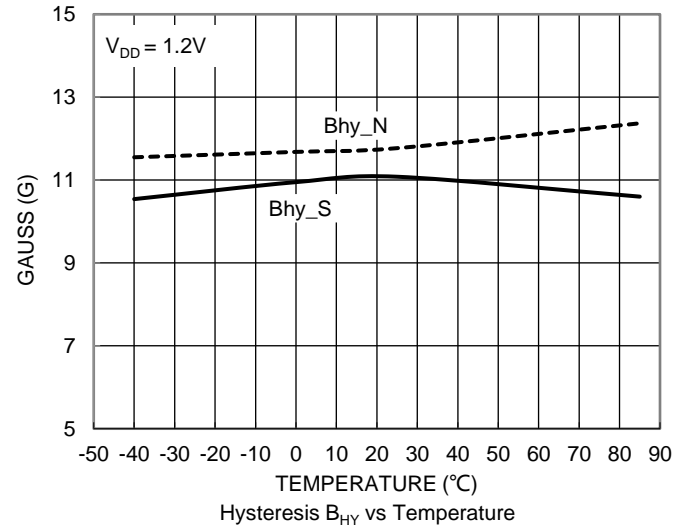
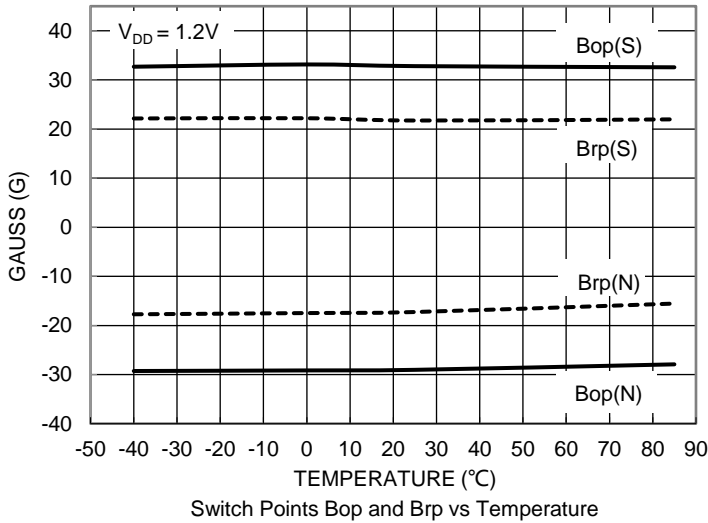
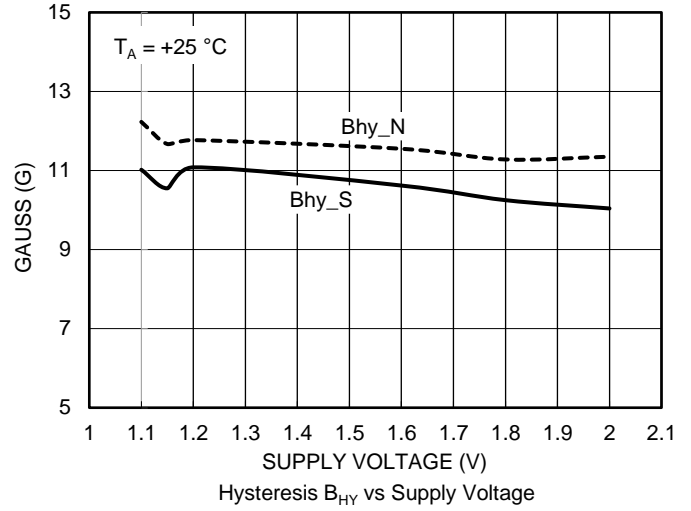
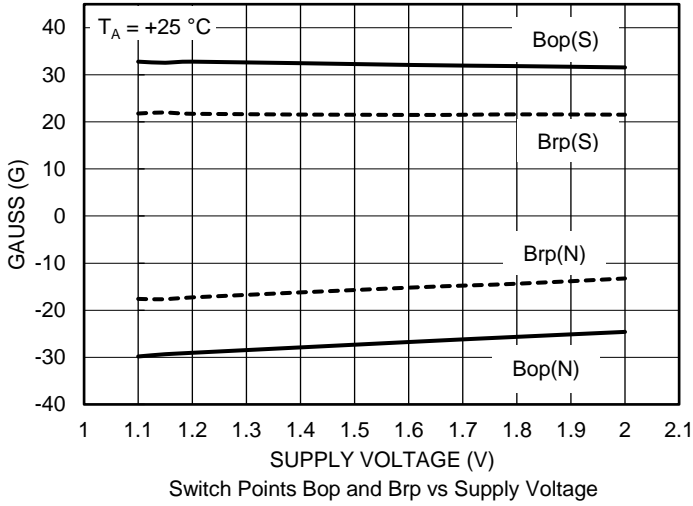


**Output High Voltage (Off)  $V_{OH}$ ,  $I_{OUT} = -0.5mA$**

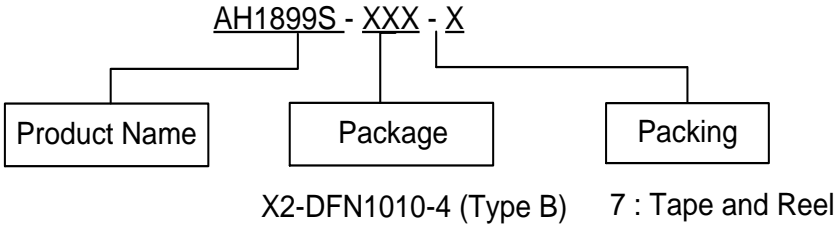


**Typical Operating Characteristics (continued)**

**Switch point  $B_{OP}/B_{RP}$  and Hysteresis  $B_{HY}$**



**Ordering Information**

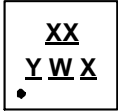


Part Number	Package	Package Code	Packing	
			Qty.	Carrier
AH1899S-FS4-7	X2-DFN1010-4 (Type B)	FS4	5000	7" Tape and Reel

**Marking Information**

(1) Package Type: X2-DFN1010-4 (Type B)

(Top View)



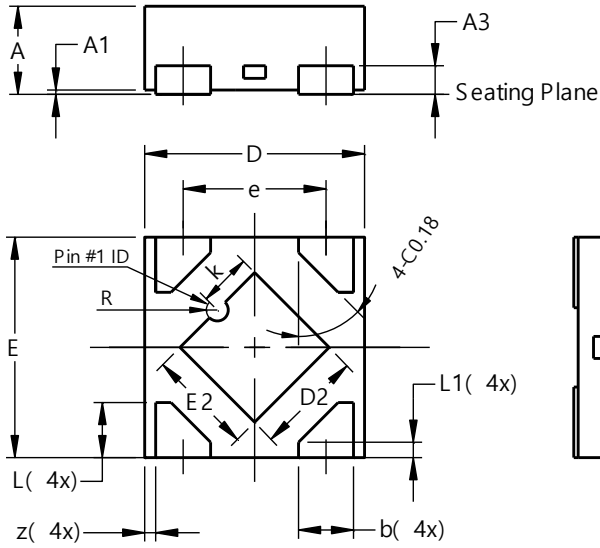
- XX : Identification Code
- Y : Year : 0 to 9
- W : Week : A to Z : 1 to 26 Week;  
a to z : 27 to 52 Week; z Represents  
52 and 53 Week
- X : Internal Code

Part Number	Package	Identification Code
AH1899S-FS4-7	X2-DFN1010-4 (Type B)	CZ

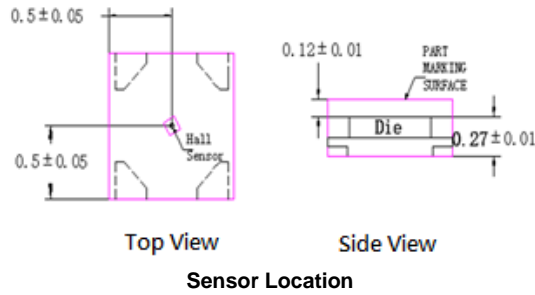
**Package Outline Dimensions**

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

**X2-DFN1010-4 (Type B)**



X2-DFN1010-4 (Type B)			
Dim	Min	Max	Typ
A	-	0.40	0.39
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	0.95	1.05	1.00
D2	0.43	0.53	0.48
E	0.95	1.05	1.00
E2	0.43	0.53	0.48
e	-	-	0.65
k	0.19	0.29	0.24
L	0.20	0.30	0.25
L1	0.02	0.12	0.07
R	0.02	0.08	0.05
z	-	-	0.050
All Dimensions in mm			

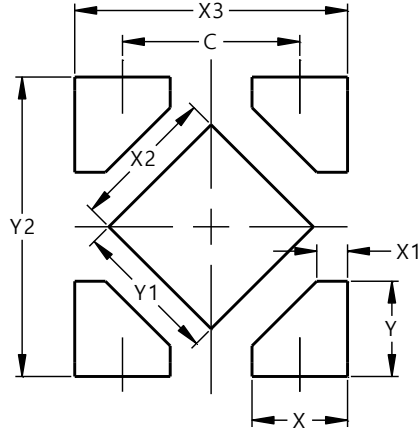




**Suggested Pad Layout**

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

**X2-DFN1010-4 (Type B)**



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	0.112
X2	0.530
X3	1.00
Y	0.350
Y1	0.530
Y2	1.100

**Mechanical Data**

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leads, Solderable per MIL-STD-202, Method 208 ④
- Weight: 0.001 grams (Approximate)

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