

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

Description

The AH1899A is a high-sensitivity micropower, Omnipolar Hall-effect switch IC with internal pullup and pulldown capability. Designed for portable and battery-powered equipment, such as cellular phones and portable PCs, the average supply current is only 0.95 μ A at 1.2V and 1.1 μ A at 1.8V. To support portable equipment, the AH1899A 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 AH1899A is available in a small low-profile X2-DFN1010-4 (Type B) package.

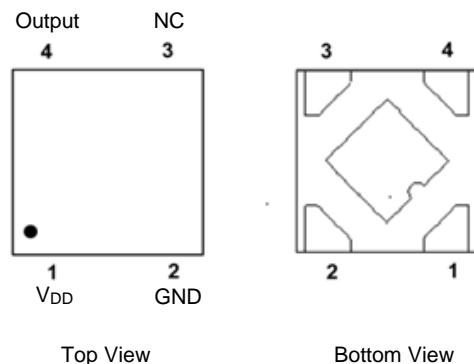
The output is activated with either a north or south pole of sufficient magnetic field strength. When the magnetic flux density (B) perpendicular to the package is larger than the operate point (B_{OP}), the output is turned on (pulled low). The output is turned off when B becomes lower than the release point (B_{RP}). 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 Pullup 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.

Pin Assignments

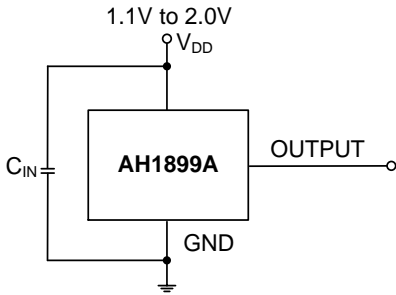


X2-DFN1010-4 (Type B)

Applications

- Cover or display switches in portable PCs
- Open and close detection for cellular phones
- Holster or cover detection for cellular phones and tablet PCs
- Digital still, video cameras, and handheld gaming consoles
- Contactless switches

Typical Applications Circuit



Note: 4. C_{IN} is for power stabilization and to strengthen the noise immunity. The recommended capacitance is 10nF to 100nF.

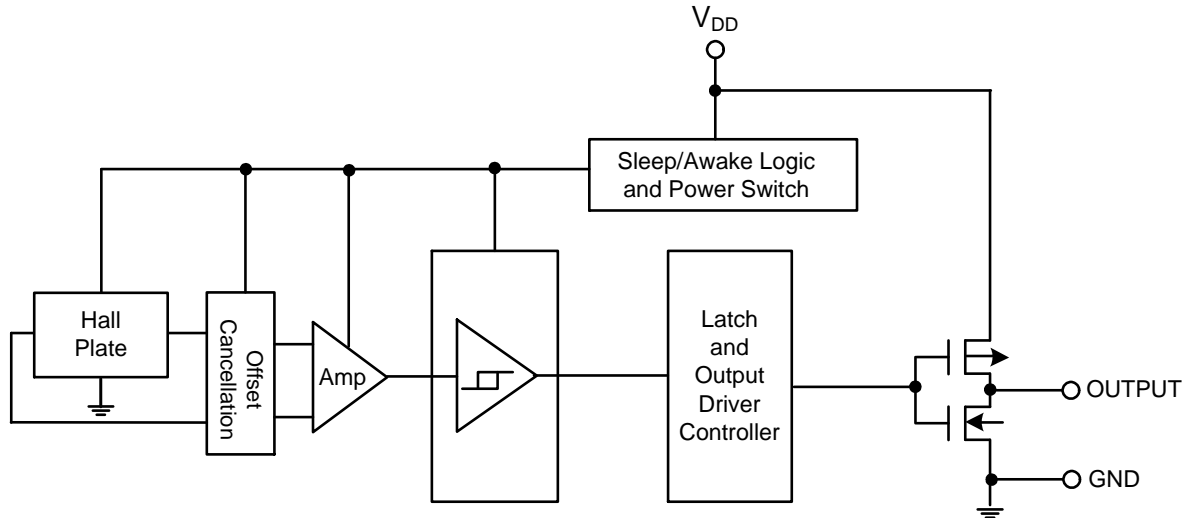
Pin Descriptions

Package: X2-DFN1010-4 (Type B)

Pin Number	Pin Name	Function
1	V_{DD}	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_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
V _{DD}	Supply Voltage (Note 7)	2.2	V
V _{DD_REV}	Reverse Supply Voltage	-0.3	V
I _{OUTPUT}	Output Current (Source and Sink)	3	mA
B	Magnetic Flux Density	Unlimited	
P _D	Package Power Dissipation	X2-DFN1010-4 (Type B)	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	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_{DD} 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.

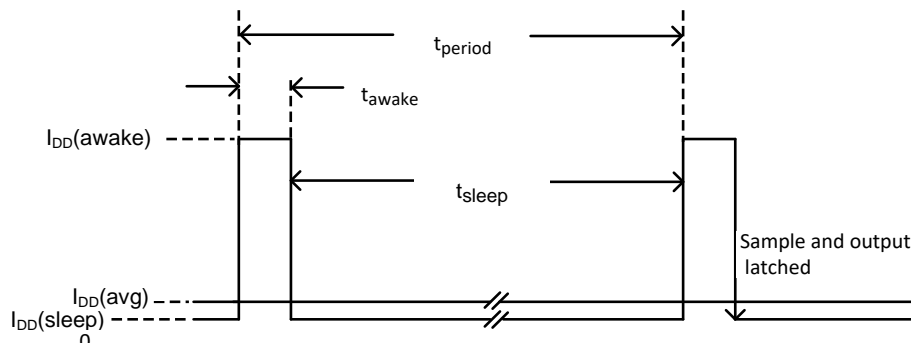
Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V _{DD}	Supply Voltage	Operating	1.1 to 2	V
T _A	Operating Temperature Range	Operating	-40 to +85	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{OL}	Output Low Voltage (On)	I _{OUT} = 0.5mA, V _{DD} = 1.2V	—	0.1	0.2	V
V _{OH}	Output High Voltage (Off)	I _{OUT} = 0.5mA, V _{DD} = 1.2V	V _{DD} -0.2	V _{DD} -0.1	—	V
I _{DD} (awake)	Supply Current	During <i>Awake</i> Period, V _{DD} = 1.2V	—	0.55	1.1	mA
		During <i>Awake</i> Period, V _{DD} = 1.8V	—	0.68	1.4	mA
I _{DD} (sleep)	Supply Current	During <i>Sleep</i> Period, V _{DD} = 1.2V	—	0.29	0.6	µA
		During <i>Sleep</i> Period, V _{DD} = 1.8V	—	0.35	0.7	µA
I _{DD} (avg)	Average Supply Current	T _A = +25°C, V _{DD} = 1.2V	—	0.95	1.8	µA
		T _A = +25°C, V _{DD} = 1.8V	—	1.1	2.2	µA
t _{awake}	Awake Time	T _A = +25°C, V _{DD} = 1.2V (Note 8)	—	45	90	µs
t _{period}	Period	T _A = +25°C, V _{DD} = 1.2V (Note 8)	—	45	90	ms
D.C.	Duty Cycle	—	—	0.1	—	%

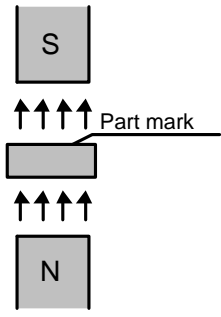
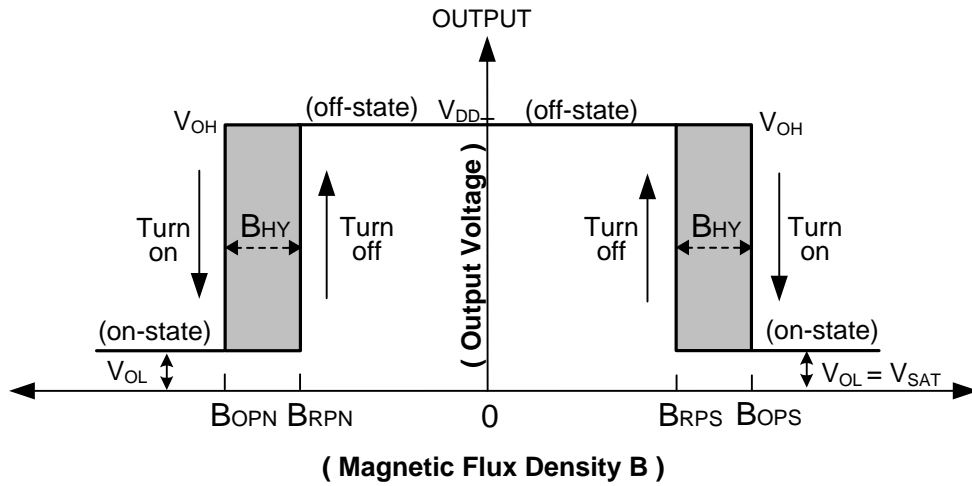
- Note: 8. When power is initially turned on, the operating V_{DD} (1.1V to 2.0V) must be applied to guarantee the output sampling. The output state is valid after the second operating cycle (typical 90ms).



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

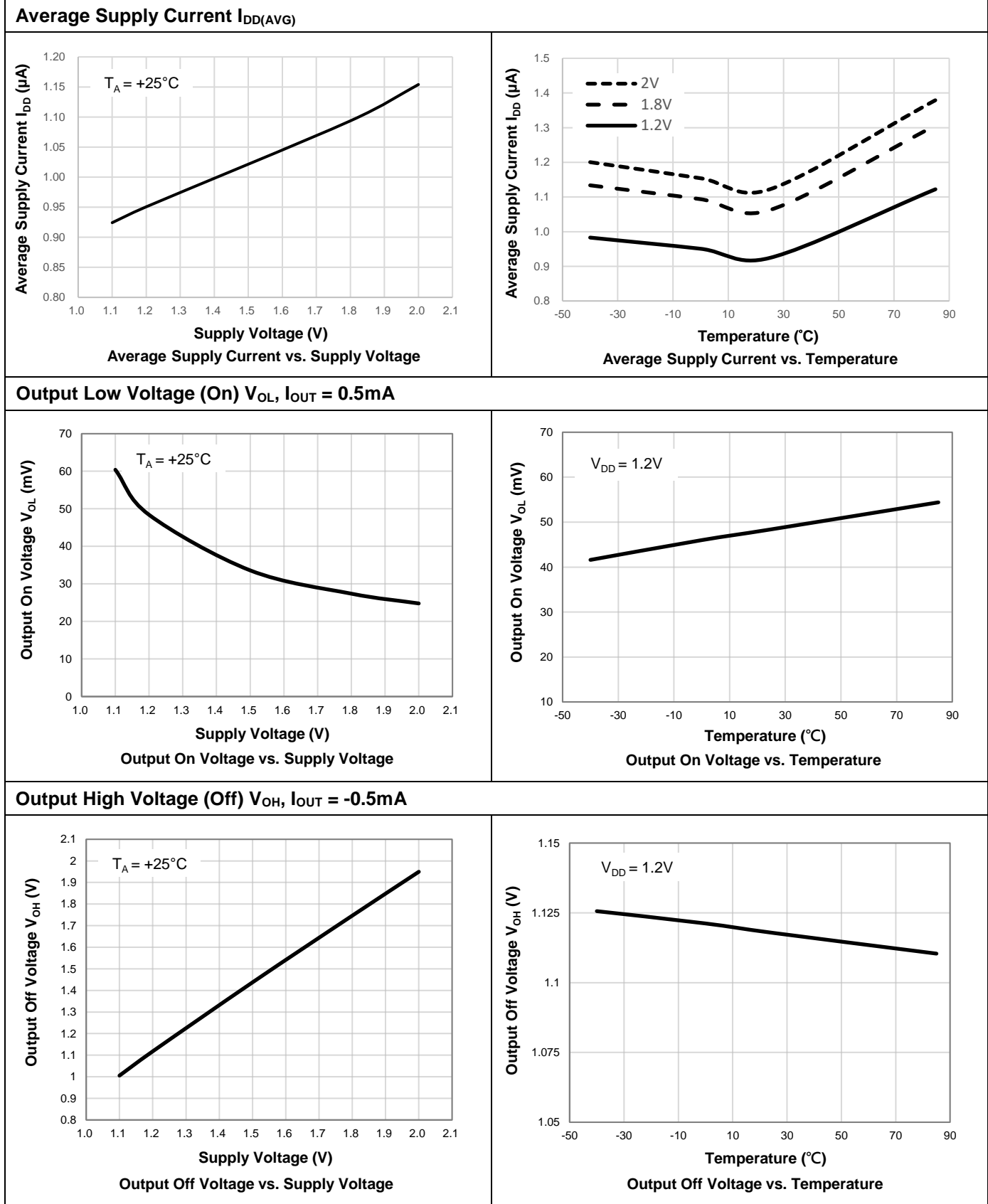
(1mT = 10 Gauss)

Symbol	Characteristics	Min	Typ	Max	Unit
B_{OPS} (South Pole to Part Marking Side)	Operation Point	6	18	30	Gauss
B_{OPN} (North Pole to Part Marking Side)		-30	-18	-6	
B_{RPS} (South Pole to Part Marking Side)	Release Point	2	12	24	
B_{RPN} (North Pole to Part Marking Side)		-24	-12	-2	
B_{HY} ($ B_{OPX} - B_{RPX} $)	Hysteresis	—	6	—	

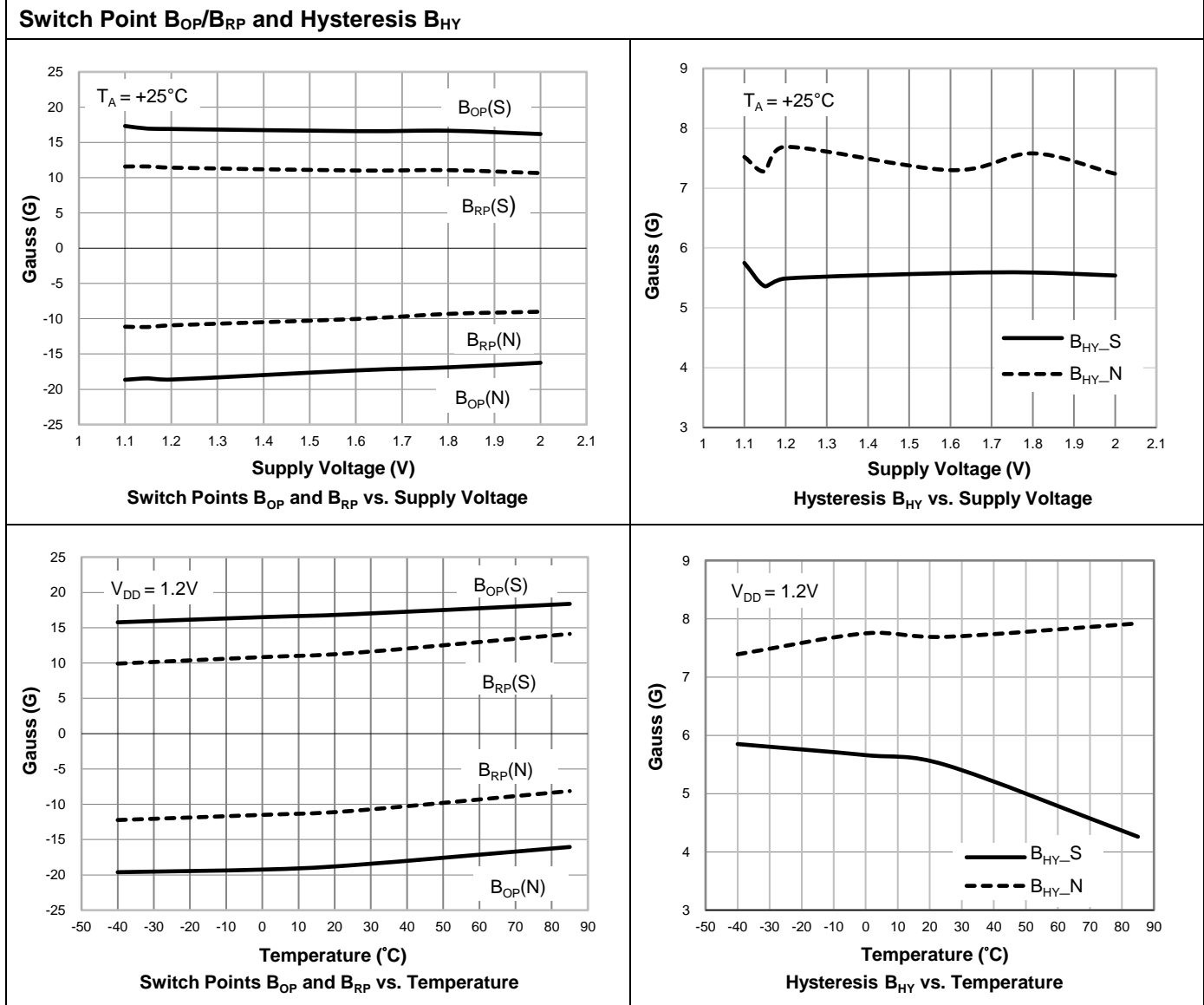


X2-DFN1010-4 (Type B)

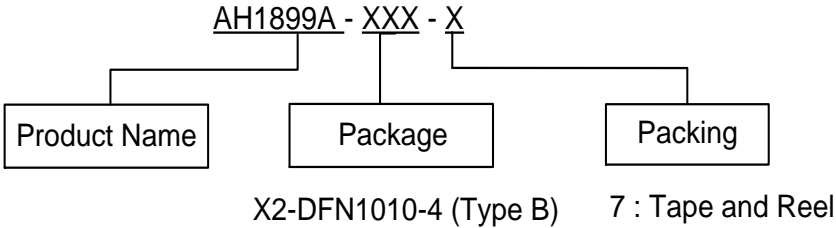
Typical Operating Characteristics



Typical Operating Characteristics (continued)



Ordering Information

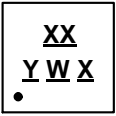


Part Number	Part Number Suffix	Package Code	Package	Packing	
				Qty.	Carrier
AH1899A-FS4-7	-7	FS4	X2-DFN1010-4 (Type B)	5000	7" Tape and Reel

Marking Information

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

(Top View)



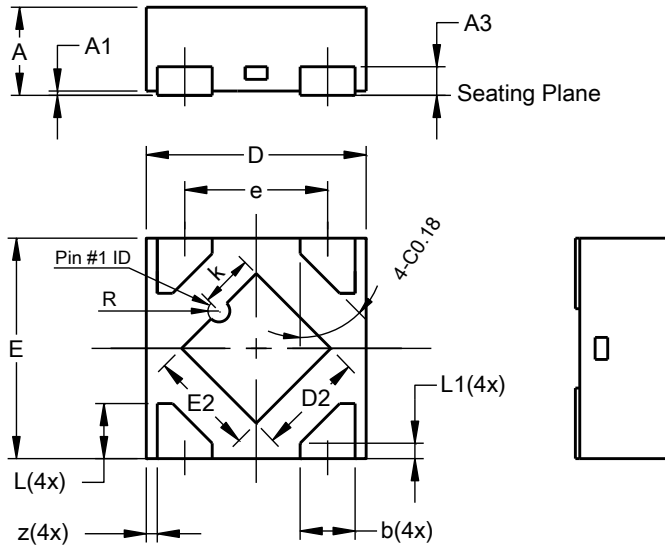
- XX : Identification Code
- Y : Year : 0 to 9 (ex: 3 = 2023)
- W : Week : A to Z : week 1 to 26;
a to z : week 27 to 52; z represents week 52 and 53
- X : Internal Code

Part Number	Package	Identification Code
AH1899A-FS4-7	X2-DFN1010-4 (Type B)	CX

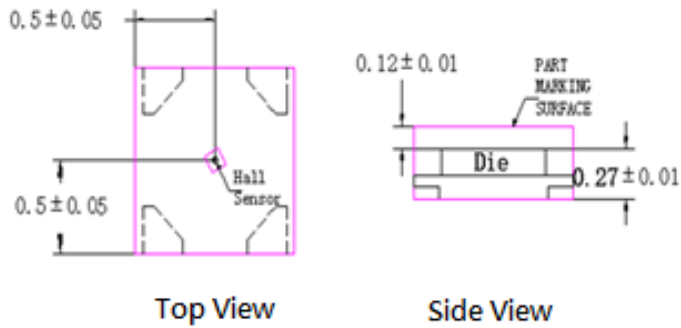
Package Outline Dimensions (All dimensions in mm.)

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			

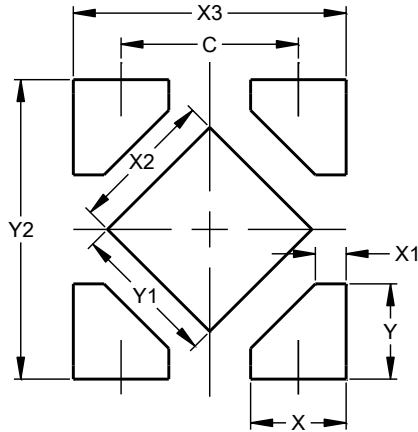


Sensor Location

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 (e4)
- Weight: 0.001 grams (Approximate)

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