



AH1806

HIGH SENSIVITY MICROPOWER OMNIPOLAR HALL-EFFECT SWITCH

Description

The AH1806 is a high-sensitivity, micro-power Omnipolar Hall effect switch IC, designed for portable and battery powered consumer to home appliance and industrial applications such as smart-meter magnetic tamper detection. Based on two sensitive Hall effect plates and a copper stabilized architecture the AH1806 provides a reliable solution over the whole operating range. To support portable and battery powered equipment, the design has been optimized to operate over the supply range of 2.5V to 5.5V and consumes only $24\mu W$ with a supply of 3V.

The single-open-drain output can be switched on with either a North or South pole of sufficient field strength. When the magnetic flux density (B) perpendicular to the package is larger than operate point (Bop) the output is switched 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

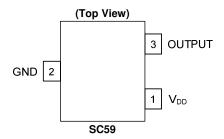
- Omnipolar (North or South Pole) Operation
- · High Sensitivity
- Single Open Drain Output
- Micropower Operation
- 2.5V to 5.5V Operating Range
- Chopper Stabilized Design Provides:

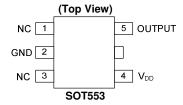
Superior Temperature Stability

Minimal Switch Point Drift Enhanced Immunity to Stress

- · Good RF Noise Immunity
- -40 °C to +85 °C Operating Temperature
- ESD (HBM) > 6KV
- Small Low Profile SOT553 and Industry Standard SC59 and SIP-3 Packages
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Pin Assignments







Applications

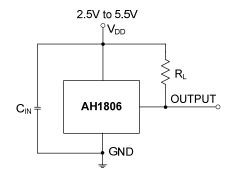
- Doors, Lids, Cover and Tray Position Detect Switches
- Display Switch for Portable PCs and Tablets
- On/Off Switch for PDAs and Digital Cameras
- Liquid Level Detection
- Smart Meters
- Position, Proximity and Level Detection Contact-Less Switch in Battery Powered Consumer, Home Appliances and Industrial Applications

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- See 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.



Typical Applications Circuit



Note:

4. C_{IN} is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 10nF to 100nF. R_L is the pull-up resistor; the recommended resistance is 10k Ω to 100k Ω .

Pin Descriptions

Package: SC59 and SIP-3

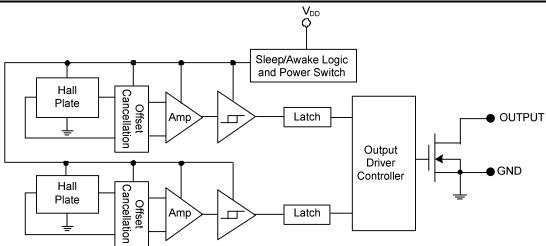
Pin Number	Pin Name	Function			
1	V_{DD}	Power Supply Input			
2	GND	Ground			
3	OUTPUT	Output			

Package: SOT553

Pin Number	Pin Name	Function			
1	NC	No Connection (Note 5)			
2	GND	Ground			
3	NC	No Connection (Note 5)			
4	V_{DD}	Power Supply Input			
5	OUTPUT	Output			

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_A = +25 ℃, unless otherwise specified.)

Symbol	Characteristics	Values	Unit	
V_{DD}	Supply Voltage (Note 7)		7	V
V _{OUT}	Output Pin Voltage (Note 7)		7	V
V _{DD REV}	Reverse Supply Voltage		-0.3	V
V_{OUT_REV}	Reverse Output Pin Voltage	-0.3	V	
Іоитрит	Output Current (source and sink)	2.5	mA	
В	Magnetic Flux Density		Unlimited	
В	Package Power Dissipation	SC59 and SOT553	230	mW
P_{D}	Fackage Fower Dissipation	SIP-3	230	mW
Ts	Storage Temperature Range	-65 to +150	∞	
TJ	Maximum Junction Temperature	+150	∞	
ESD HBM	Human Body Model ESD capability		6	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_{DD} of 7V 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.

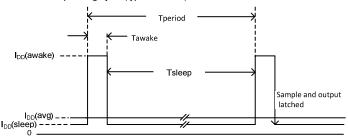
Recommended Operating Conditions (@TA = +25 ℃, unless otherwise specified.)

Symbol	Characteristic	Characteristic Conditions		Unit
V_{DD}	Supply Voltage	Operating	2.5 to 5.5	٧
V_{OUT_MAX}	Maximum Output Pin Voltage	Operating	5.5	V
TA	Operating Temperature Range	Operating	-40 to +85	°C

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

Symbol	Characteristic	Conditions	Min	Тур	Max	Unit
V _{OUT_ON}	Output On Voltage (V _{OL})	I _{OUT} = 1mA	_	0.1	0.3	٧
l _{off}	Output Leakage Current	$V_{OUT} = 5.5V$, Output off	_	< 0.1	1	μΑ
l (auralia)		During 'awake' period, T _A = 25 °C, V _{DD} = 3V		3	6	mA
I _{DD} (awake)	` ,	During 'awake' period, T _A = -40 to +85 °C, V _{DD} = 2.5V to 5.5V	_	3	12	mA
I _{DD} (sleep)	Supply Current	During 'sleep' period, T _A = +25 °C, V _{DD} = 3V	_	5	10	μΑ
I _{DD} (sleep)		During 'sleep' period, $T_A = -40 \text{ to } +85 ^{\circ}\text{C}, V_{DD} = 2.5 \text{V to } 5.5 \text{V}$	_	_	28	μΑ
. (0.10)	Average Cumply Current	T _A = +25 °C, V _{DD} = 3V	_	8	16	μΑ
I _{DD} (avg)	Average Supply Current	$T_A = -40 \text{ to } +85 ^{\circ}\text{C}, V_{DD} = 2.5 \text{V to } 5.5 \text{V}$	_	_	40	μΑ
Tawake	Awake Time (Note 8)		_	75	125	μs
Tperiod	Period	(Note 8)	_	75	125	ms
D.C.	Duty Cycle	_	_	0.1	_	%

Note: 8. When power is initially turned on, the operating V_{DD} must be within its correct operating range (2.5V to 5.5V) to guarantee the output sampling. The output state is valid after the second operating cycle (typical 150ms).





Magnetic Characteristics (Notes 9 & 10) (@T_A = +25 °C, V_{DD} = 3V, unless otherwise specified.)

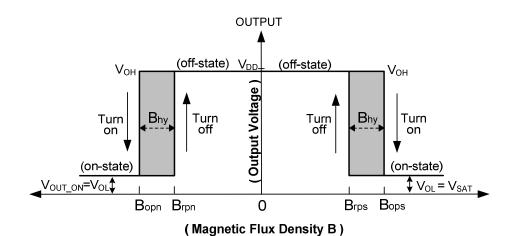
(1mT=10 Gauss)

Symbol	Characteristic	Conditions	Min	Тур	Max	Unit
Dana (aguth nala ta nart marking aida)	Operation Daint	_	15	30	45	
Bops (south pole to part marking side)	Operation Point	$V_{DD} = 2.5V \text{ to } 5.5V$	10	30	45	
Donn (north note to nort morting side)	Operation Daint	_	-45	-30	-15	
Bopn (north pole to part marking side)	Operation Point	$V_{DD} = 2.5V \text{ to } 5.5V$	-45	-30	-10	
Dung (south real atomout monthing side)	Dalagas Daint	_	10	20	40	Gauss
Brps (south pole to part marking side)	Release Point	$V_{DD} = 2.5V \text{ to } 5.5V$	4	20	40	
Duran (noutle note to nout monthing side)	Dalagas Daint	_	-40	-20	-10	
Brpn (north pole to part marking side)	Release Point	V _{DD} = 2.5V to 5.5V	-40	-20	-4	
Bhy (Bopx - Brpx)	Hysteresis (Note 11)	_	5	10	_	

Notes:

- 9. Typical data is at $T_A = +25$ °C, $V_{DD} = 3V$, and for design information only.
- 10. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.

 11. Maximum and minimum hysteresis is guaranteed by design and characterization.

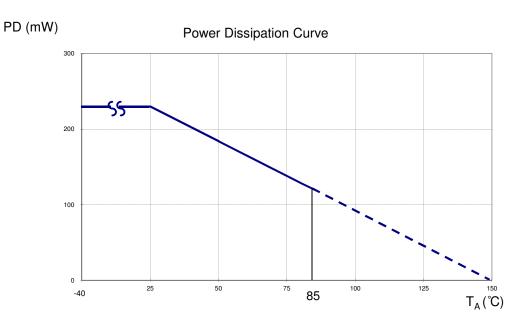




Thermal Performance Characteristics

(1) Package Type: SC59, SOT553 and SIP-3

T _A (°C)	25	50	60	70	80	85	90	100	110	120	130	140	150
P _D (mW)	230	184	166	147	129	120	110	92	74	55	37	18	0



Ordering Information

АН1806 - <u>Х</u> - <u>7</u> Package Packing W: SC59 7: Tape & Reel

A: Ammo Box (Note 12) Z:SOT553

B: Bulk (Note 13) P:SIP-3

	Package	Bulk			7" Tape an	d Reel	Ammo Box	
Device	Code	Packaging	Quantity	Part Number Suffix	Quantity	Part Number Suffix	Quantity	Part Number Suffix
AH1806-P-A	Р	SIP-3	NA	NA	NA	NA	4,000/Box	-A
AH1806-P-B	Р	SIP-3	1,000	-B	NA	NA	NA	NA
AH1806-W-7	W	SC59	NA	NA	3,000/Tape & Reel	-7	NA	NA
AH1806-Z-7	Z	SOT553	NA	NA	3,000/Tape & Reel	-7	NA	NA

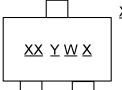
12. Ammo Box is for SIP-3L Spread Lead.13. Bulk is for SIP-3L Straight Lead. Notes:



Marking Information

(1) Package Type: SC59





XX: Identification code

<u>Y</u> : Year 0 to 9

W: Week: A to Z: 1 to 26 week;

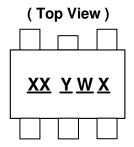
a to z: 27 to 52 week; z represents

52 and 53 week

X: Internal Code

Part Number	Package	Identification Code	
AH1806	SC59	H6	

(2) Package Type: SOT553



 \underline{XX} : Identification Code

 $\overline{\underline{Y}}$: Year: 0 to 9

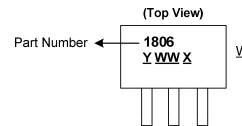
 \underline{W} : Week: A to Z: 1~26 week;

a to z: 27~52 week; z represents 52 and 53 week

52 and 53 week X: Internal code

Part Number	Package	Identification Code	
AH1806	SOT553	H6	

(3) Package Type: SIP-3



<u>Y</u> : Year : 0~9

 \underline{WW} : Week : 01~52, "52" represents

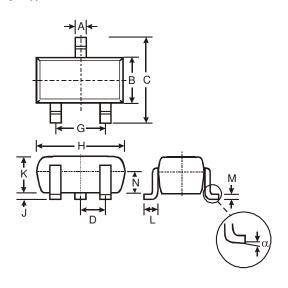
52 and 53 week X: Internal Code



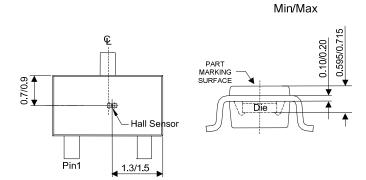
Package Outline Dimensions (All dimensions in mm.)

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

(1) Package Type: SC59



	SC59								
Dim	Min	Max	Тур						
Α	0.35	0.50	0.38						
В	1.50	1.70	1.60						
С	2.70	3.00	2.80						
D	-	-	0.95						
G	-	1	1.90						
Н	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						
М	0.10	0.20	0.15						
N	0.70	0.80	0.75						
α	0°	8°	-						
All	All Dimensions in mm								



Sensor Location

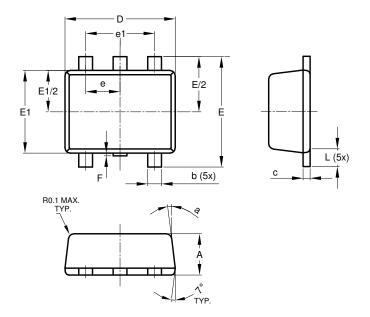
7 of 12



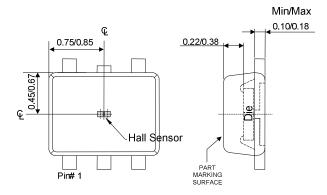
Package Outline Dimensions (Continued) (All dimensions in mm.)

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

(2) Package Type: SOT553



SOT553							
Dim	Min	Max	Тур				
Α	0.55	0.62	0.60				
b	0.15	0.30	0.20				
С	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				
е	().50 BS(
e1	1	1.00 BS0					
F	0.00	0.10	_				
Ĺ	0.10	0.30	0.20				
а	6°	8°	7°				
All [Dimensi	ions in I	mm				



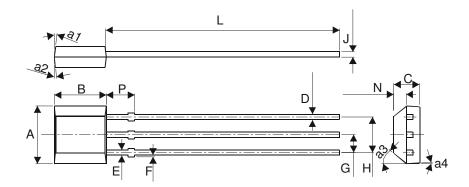
Sensor Location



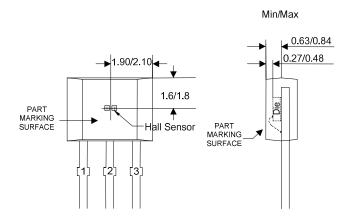
Package Outline Dimensions (Cont.) (All dimensions in mm.)

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

(3) Package Type: SIP-3 for Bulk Pack



SIP-3			
for Bulk Pack Only			
Dim	Min	Max	
Α	3.9	4.3	
a1	5° Typ		
a2	5° Typ		
a3	45° Typ		
a4	3°Typ		
В	2.8	3.2	
С	1.40	1.60	
D	0.33	0.432	
Е	0.40	0.508	
F	0	0.2	
G	1.24	1.30	
Н	2.51	2.57	
J	0.35	0.43	
L	14.0	15.0	
N	0.63	0.84	
Р	1.55	-	
All Dimensions in mm			



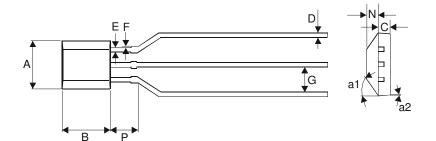
Sensor location



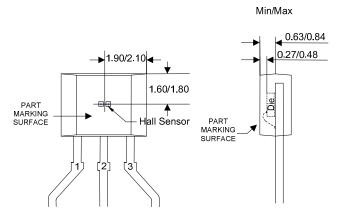
Package Outline Dimensions (Cont.) (All dimensions in mm.)

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

(4) Package Type: SIP-3 for Ammo Pack



SIP-3				
for Ammo Pack only				
Dim	Min	Max		
Α	3.9	4.3		
a1	45° Typ			
a2	3°Typ			
В	2.8	3.2		
С	1.40	1.60		
D	0.35	0.41		
Е	0.43	0.48		
F	0	0.2		
G	2.4	2.9		
N	0.63	0.84		
Р	1.55	-		
All Dimensions in mm				



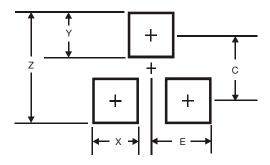
Sensor location



Suggested Pad Layout

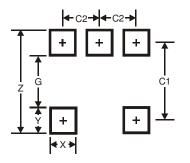
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(1) Package Type: SC59



Dimensions	Value (in mm)
Z	3.4
X	0.8
Υ	1.0
С	2.4
E	1.35

(2) Package Type: SOT553



Dimensions	Value (in mm)
Z	2.2
G	1.2
Х	0.375
Υ	0.5
C1	1.7
C2	0.5



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