



AH3776

HIGH-VOLTAGE, HIGH-SENSITIVITY HALL EFFECT LATCH

Description

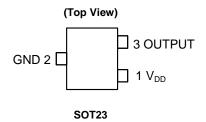
The AH3776 is a high-voltage, medium-sensitivity Hall Effect latch IC designed for commutation of brushless DC motors, flow meters, linear encoders and position sensors in industrial and consumer home appliances and personal care applications. To support a wide range of demanding applications, the design is optimized to operate over the supply range of 3.0V to 28V. With chopper stabilized architecture and an internal bandgap regulator to provide temperature compensated supply for internal circuits, the AH3776 provides a reliable solution over the whole operating range. For robustness and protection, the device has a reverse blocking diode with a Zener clamp on the supply. The output has an overcurrent limit and a Zener clamp.

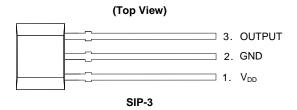
The single, open-drain output can be switched on with South pole of sufficient strength and switched off with North pole of sufficient strength. When the magnetic flux density (B) perpendicular to the package is larger than the operate point (B_{OP}) the output is switched on (pulled low). The output is held latched until magnetic flux density reverses and becomes lower than the release point (B_{RP}).

Features

- · Bipolar Latch (South Pole: On, North Pole: off)
- · 3.0V to 28V Operating Voltage Range
- High Sensitivity: B_{OP} and B_{RP} of +110G and -110G Typical
- · Single, Open-Drain Output with Overcurrent Limit
- Chopper Stabilized Design Provides
 - Superior Temperature Stability
 - Minimal Switch Point Drift
 - Enhanced Immunity to Stress
- · Good RF Noise Immunity
- · Reverse Blocking Diode and Zener Clamp on Supply
- -40°C to +125°C Operating Temperature
- ESD (HBM): 6kV
- Industry Standard SC59, SOT23 and SIP-3 Packages
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Pin Assignments





Applications

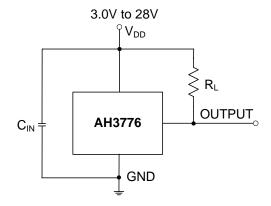
- · Brushless DC Motor Commutation
- · Revolution Per Minute (RPM) Measurement
- Flow Meters
- · Angular and Linear Encoder and Position Sensors
- Contact-less Commutation, Speed Measurement and Angular Position Sensing/Indexing in Consumer Home Appliances, Office Equipment and Industrial Applications

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 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:

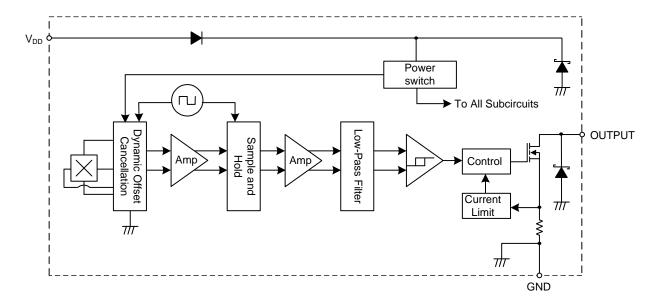
4. C_{IN} is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 10nF \sim 100nF. R_L is the pull-up resistor.

Pin Descriptions

Package: SOT23 and SIP-3

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

Functional Block Diagram





Absolute Maximum Ratings (Notes 5 & 6) (@T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic		Value	Unit	
V_{DD}	Supply Voltage (Note 6)		32	V	
V_{DDR}	Reverse Supply Voltage		-32	V	
V _{OUT_MAX}	Output Off Voltage (Note 6)		32V	V	
l _{out}	Continuous Output Current		60	mA	
I _{OUT_R}	Reverse Output Current		-50	mA	
В	Magnetic Flux Density		Unlimited		
D-	Package Power Dissipation	SIP-3	550	mW	
P _D	Fackage Fower Dissipation	SOT23	230		
Ts	Storage Temperature Range		-65 to +165	°C	
TJ	Maximum Junction Temperature	+150	°C		
ESD	Electrostatic Discharge Withstand Capability - Human Body M	odel	6	kV	

Notes:

- 5. 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.
- 6. The absolute maximum V_{DD} of 32V 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 = -40°C to +125°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V_{DD}	Supply Voltage	Operating	3.0 to 28	V
T _A	Operating Temperature Range	Operating	-40 to +125	°C

Electrical Characteristics (Notes 7 & 8) (@TA = -40°C to +125°C, VDD = 3V to 28V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
mW	Output ON Voltage	$I_{OUT} = 20$ mA, B > B _{OP}	1	0.2	0.4	V
I _{OUT_OFF}	Output Leakage Current	$V_{OUT} = 28V$, B < B _{RP} , Output off	-	<0.1	10	μA
1	Supply Current	Output open, T _A = +25°C	ı	3	-	mA
I _{DD}		Output open, $T_A = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$		-	4	mA
I _{DD R}	Reverse Battery Current	$V_{DD} = -18V$, $T_A = -40^{\circ}C$ to $+125^{\circ}C$	1	-0.01	1	mA
IDD_R	Reverse Battery Current	$V_{DD} = -28V$, $T_A = -40^{\circ}C$ to $+125^{\circ}C$	1	-0.01	1.5	mA
tsT	Device Start-Up Time	$V_{DD} >= 3V, B > B_{OP} $ (Note 7)	ı	10		μs
f _c	Chopping Frequency	$V_{DD} = 3V$ to 28V	į	800	1	kHz
t _d	The time delay from magnetic threshold reached to the start of the output rise or fall	(Note 9)	-	3.75	-	μs
t _r	Output Rising Time (external pull-up resistor R∟ and load capacitance dependent)	$R_L = 1k\Omega$, $C_L = 20pF$	ı	0.2	1	μs
t _f	Output Falling Time (Internal switch resistance and load capacitance dependent)	$R_L = 1k\Omega$, $C_L = 20pF$	-	0.1	1	μs
I _{OCL}	Output Current Limit	B>B _{OP} , (Note 10)	30	-	55	mA
Vz	Zener Clamp Voltage	$I_{DD} = 5mA$	28	-	-	V

Notes:

- 7. When power is initially turned on, Vob must be within its correct operating range (3.0V to 28V) to guarantee the output sampling. The output state is valid after the start-up time of 10µs typical from the operating voltage reaching 3V.
- 8. Typical values are defined at T_A = +25°C, V_{DD} = 12V. Maximum and minimum values over the operating temperature range is not tested in production but guaranteed by design, process control and characterization.
- 9. Guaranteed by design, process control and characterization. Not tested in production.
- 10. The device will limit the output current IOUT to current limit of IOCL.

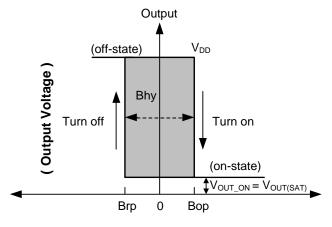


Magnetic Characteristics (Notes 11 &12) (T_A = -40°C to +125°C, V_{DD} = 3.0V to 28V, unless otherwise specified)

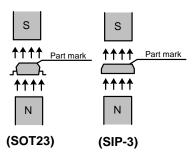
				(1mT=10 G	auss)
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
B _{OP} (South pole to part marking side)	Operation Point	V _{DD} = 12V, T _A = +25°C	i	110	i	
BOP (South pole to part marking side)	Operation Form	$T_A = -40^{\circ}C$ to +125°C	80	110	140	
B _{RP} (North pole to part marking side)	$V_{DD} = 12V, T_A = +25^{\circ}C$		-	-110	-	Gauss
	Release Point	T _A = -40°C to +125°C	-140	-110	-80	Gauss
D (ID I ID I)	Hyptorogic (Note 12)	V _{DD} = 12V, T _A = +25°C	-	220	-	
Bhy (Bopx - Brpx)	Hysteresis (Note 13)	T _A = -40°C to +125°C	160	220	280	

Notes:

- 11. When power is initially turned on, V_{DD} must be within its correct operating range (3.0V to 28V) to guarantee the output sampling. The output state is valid after the start-up time of 10µs typical from the operating voltage reaching 3V.
- 12. Typical values are defined at T_A = +25°C, V_{DD} = 12V. Maximum and minimum values over the operating temperature range are not tested in production but guaranteed by design, process control and characterization.
- 13. Maximum and minimum hysteresis are guaranteed by design, process control and characterization.



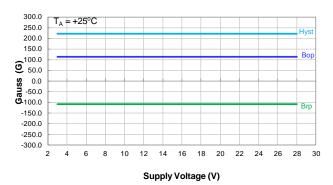
(Magnetic Flux Density B)



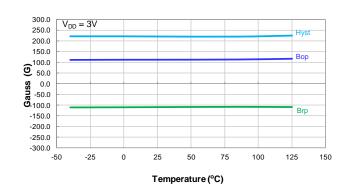


Typical Operating Characteristics

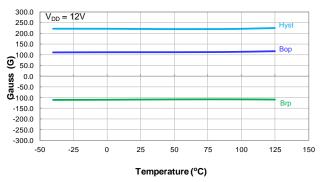
Magnetic Operating Switch Points - BOP and BRP



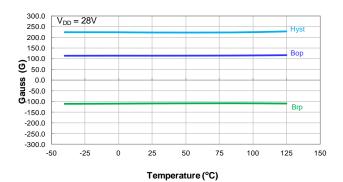
Switch Points Bop and Brp vs Supply Voltage



Switch Points Bop and Brp vs Temperature

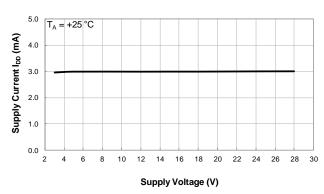


Switch Points Bop and Brp vs Temperature

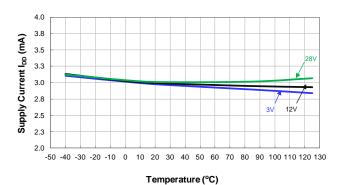


Switch Points Bop and Brp vs Temperature

Supply Current



Supply Current vs Supply Voltage

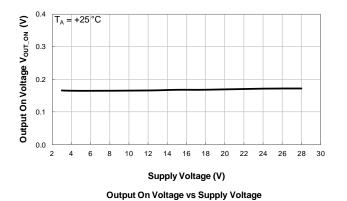


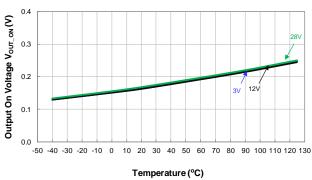
Supply Current vs Temperature



Typical Operating Characteristics (continued)

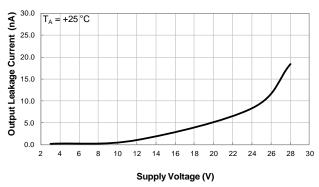
Output Switch On Voltage



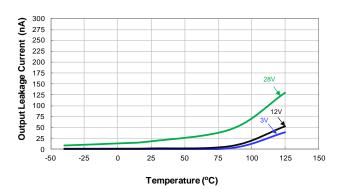


Output On Voltage vs Temperature

Output Switch Leakage Current

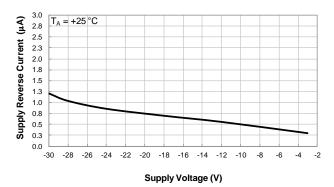


Output Leakage Current vs Supply Voltage

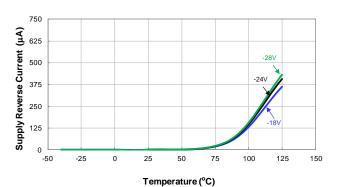


Output Leakage Current vs Temperature

Supply Reverse Current



Supply Reverse Current vs Supply Voltage



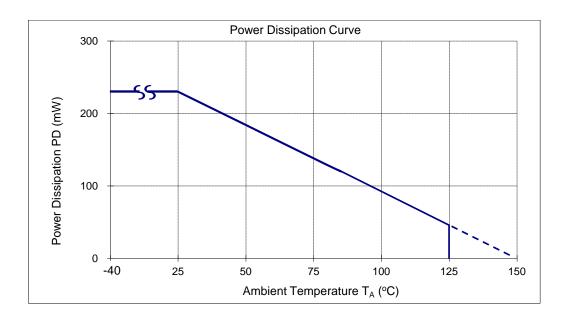
Supply Reverse Current vs Temperature



Thermal Performance Characteristics

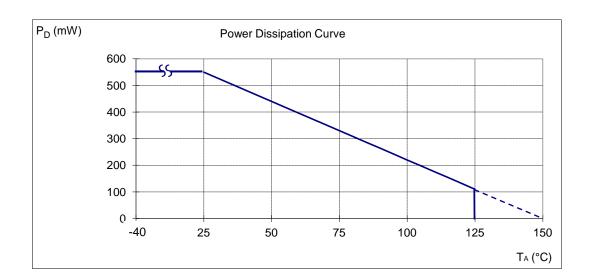
(1) Package types: SOT23

T _A (°C)	25	50	60	70	80	85	90	100	105	110	120	125	130	140	150
P _D (mW)	230	184	166	147	129	120	110	92	83	74	55	46	37	18	0



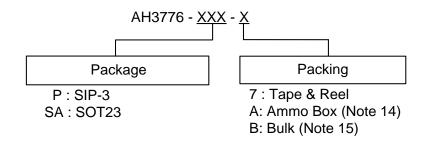
(2) Package type: SIP-3

T _A (°C)	25	50	60	70	80	85	90	100	105	110	120	125	130	140	150
P _D (mW)	550	440	396	362	308	286	264	220	198	176	132	110	88	44	0





Ordering Information



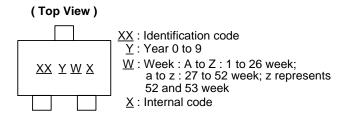
	Package Packaging		Bulk 7" Tape an		7" Tape and		Amm	по Вох
Part Number	Code	1 ackaging	Quantity	Part Number Suffix	Quantity	Part Number Suffix	Quantity	Part Number Suffix
AH3776-P-A	Р	SIP-3	NA	NA	NA	NA	4,000/Box	-A
AH3776-P-B	Р	SIP-3	1,000	-B	NA	NA	NA	NA
AH3776-SA-7	SA	SOT23	NA	NA	3,000/Tape & Reel	-7	NA	NA

Notes: 14. Ammo Box is for SIP-3 Spread Lead.

15. Bulk is for SIP-3 Straight Lead.

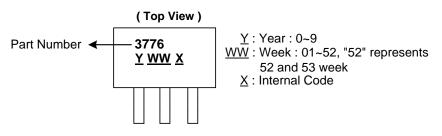
Marking Information

(1) Package Type: SOT23



Part Number	Package	Identification Code		
AH3776	SOT23	ZF		

(2) Package Type: SIP-3



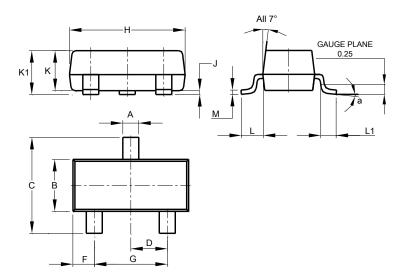
Part Number	Package	Identification Code		
AH3776	SIP-3	3776		



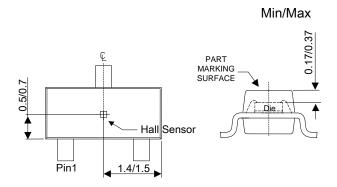
Package Outline Dimensions (All dimensions in mm.)

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

(1) Package Type: SOT23



	SOT23							
Dim	Min	Max	Тур					
Α	0.37	0.51	0.40					
В	1.20	1.40	1.30					
С	2.30	2.50	2.40					
D	0.89	1.03	0.915					
F	0.45	0.60	0.535					
G	1.78	2.05	1.83					
Н	2.80	3.00	2.90					
J	0.013	0.10	0.05					
K	0.890	1.00	0.975					
K1	0.903	1.10	1.025					
L	0.45	0.61	0.55					
L1	0.25	0.55	0.40					
М	0.085	0.150	0.110					
а	a 8°							
All	Dimens	ions in	mm					



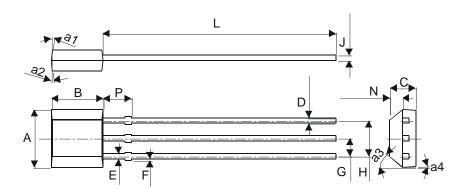
Sensor Location



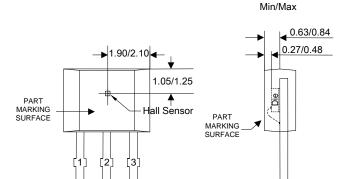
Package Outline Dimensions (continued) (All dimensions in mm.)

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

(2) Package Type: SIP-3 Bulk



;	SIP-3 (Bulk)							
Dim	Min	Max						
Α	3.9	4.3						
a1	5°	Тур						
a2	5°	Тур						
a3	45°	[°] Typ						
a4	3°	Тур						
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 Di	mension	s in mm						



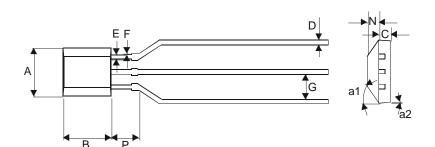
Sensor Location



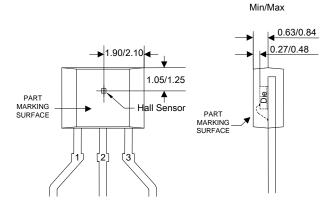
Package Outline Dimensions (cont.) (All dimensions in mm.)

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

(3) Package Type: SIP-3 Ammo Pack



SIP-3 (Ammo Pack)		
Dim	Min	Max
Α	3.9	4.3
a1	45° Typ	
a2	3° Тур	
В	2.8	3.2
C	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		



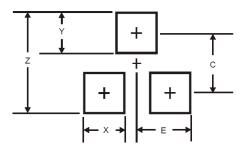
Sensor Location



Suggested Pad Layout

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

(1) Package Type: SOT23



Dimensions	Value (in mm)
Z	2.9
Х	0.8
Y	0.9
С	2.0
Е	1.35



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AH3776
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