1 Features and Benefits

- Digital output
- Stable over the entire temperature range
- Wide operating voltage range: 4.5V ~ 24V
- Strong resistance to mechanical stress
- Non-contact output, safety and reliable
- Directy drive the coils of DC motor (Fan)
- Immunity to logic race condition
- Short switch time and good switch sensitivity
- TO-94 package
- Developed according to the EU RoHS & REACH

2 Application Examples

- Automotive electronics, Consumer electronics and Industrial electronics
- Water flow sensing
- Electronic steering column lock
- Door latch system
- Seat adjustment
- Speed measurement and tachometer
- Motor control
- Brushless DC motor

3 Selection Guide

Part Number	Packing	Mounting	Operating, To	B_{RP} (Min)	B_{OP}(Max)
AH4059	Anti-static bag, 1000 pieces/bag	4-pin SIP through hole	–40ºC ~ 85ºC	3.0mT	13.0mT

NOTE: Hall ICs are soldered tin brazing for assembly, and wave soldering of SOT-23-3L and SOT-89 surface-mounted components poses a risk of failure.

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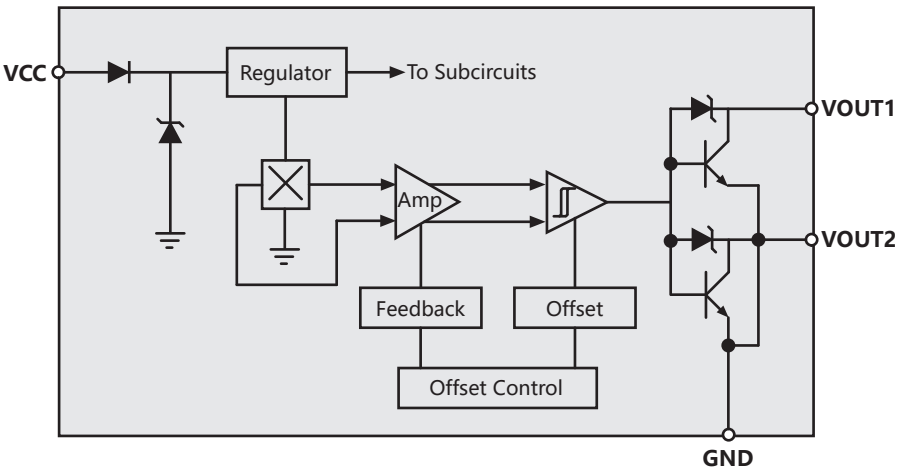
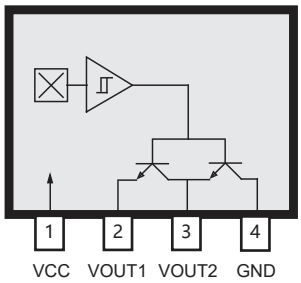
4 General Description

AH4059 Hall Sensor is a kind of bipolar Hall switch with two complementary outputs. It is particularly suitable for double coil DC motor, double coil DC fan, speed measurement and rotation control. The sensor chip intergrated bandgap reference voltage source, Hall voltage generator, signal amplifier, hysteresis controller, reverse voltage protection diode, and circuit units such as an open-collector output driver with two complementary outputs with a sink current of 300mA. High-performance bandgap reference voltage source ensures consistent sensitivity of the sensor over a wide temperature range. Reverse voltage protection diodes avoid reverse power failures.



5 Terminal List

TO-94



Name	Description	Number
VCC	Power Supply Input	1
GND	Output 1	2
VOUT1	Output 2	3
VOUT2	Ground	4

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6 Absolute Maximum Ratings

Characteristic	Symbol	Note	Rating	Unit
Supply Voltage	V_{CC}		28	V
Reverse Supply Voltage	V_{ROUT}		-0.5	V
Output Current	$I_{OUTSINK}$		500	mA
Magnetic Flux Density	B		Unlimited	mT
Operating Temperature	T_O	E	-40 ~ 85	°C
Maximum Junction Temperature	$T_{J(max)}$	Too high a Tj could lead to electrical or thermal breakdown	165	°C
Storage Temperature	T_{stg}		-50 ~ 160	°C
ESD sensitivity – HBM	-		6	kV

NOTE 1. Human Body Model according to AEC-Q100-002 standard.

7 Electrical Operating Characteristics

valid through the full operating temperature range; unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	Operating, T_J<165°C	4.5	-	24	V
High-level Output Voltage	V_{OH}	V_{CC}=24V，R_L=10kΩ，B < B_{RP}	23.5	-	24	V
Low-level Output Voltage	V_{OL}	I_{OUTMAX}=25mA，B >B_{OP}	0	-	0.5	V
Supply Current	I_{CC}	V_{CC}=24V	-	6.0	8.0	mA
Output leakage Current	I_{OUTOFF}	V_{OUT}=24V，B <B_{RP}	-	-	10	μA
Power-On Time	t_{PO}		-	-	30	μs
Output-Rise Time	t_R	V_{CC}=12V ,R_L=1.2kΩ, C=12pF	-	-	2	μs
Output-Fall Time	t_F	V_{CC}=12V ,R_L=1.2kΩ, C=12pF	-	-	2	μs

NOTE 1. Power-On Time, t_{PO}, is defined as: the time it takes for the output voltage to settle within ±10% of its steady state value under an applied magnetic field, after the power supply has reached its minimum specified operating voltage, V_{CC} (min).

8 Magnetic Operating Characteristics

valid through the full operating temperature range; unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Point	B_{OP}	Operating, T_J<165°C	-	4.0	13.0	mT
Release Point	B_{RP}	V_{CC}=24V, R_L=10kΩ， B < B_{RP}	3.0	-4.0	-	mT
Hysteresis	B_H	I_{OUT}=25mA, B > B_{OP}	-	8.0	-	mT

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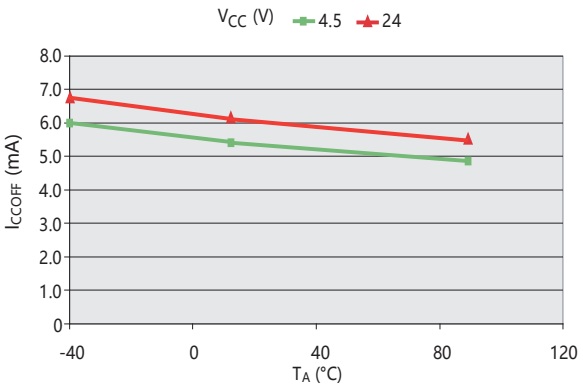
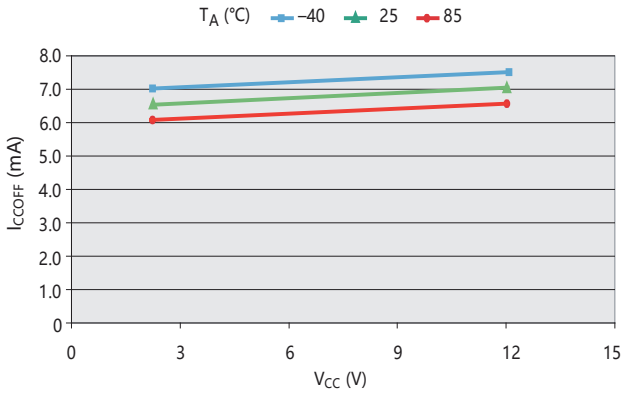
9 Characteristic Curves (Type UA)

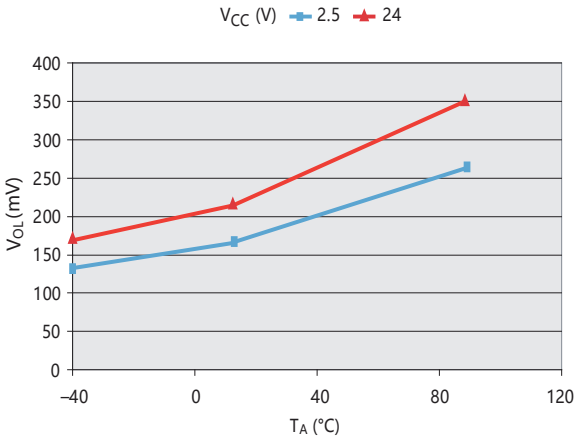
Supply Current (Off) versus Ambient Temperature



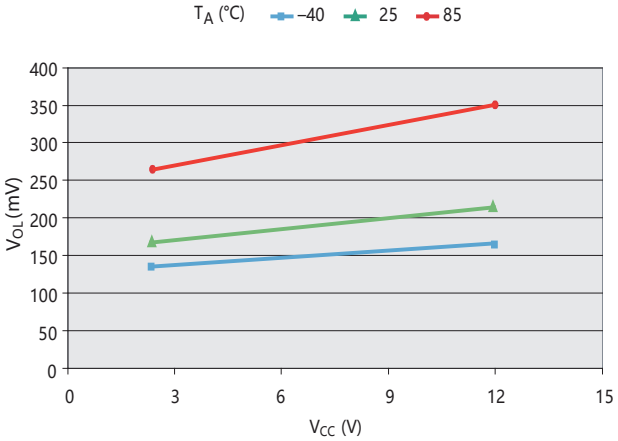
Supply Current (Off) versus Supply Voltage



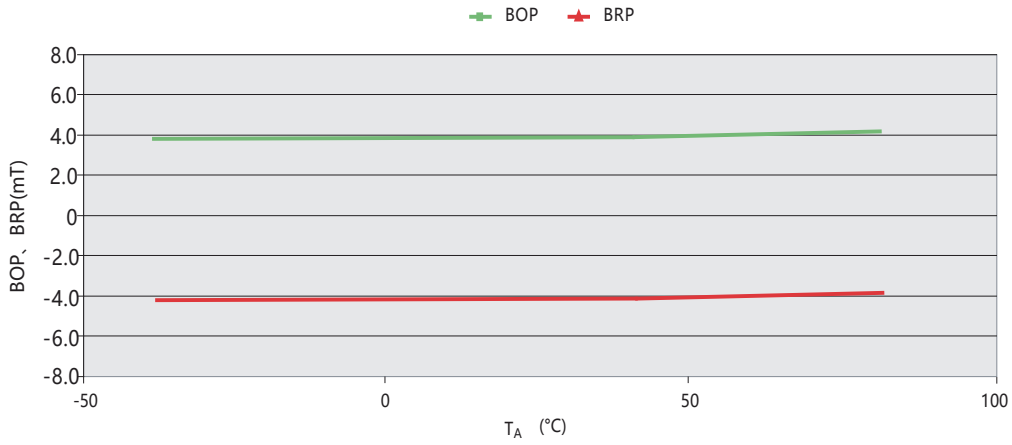
Low-level Output (On) versus Ambient Temperature



Low-level Output (On) versus Supply Voltage



Operating and Release Point versus Ambient Temperature



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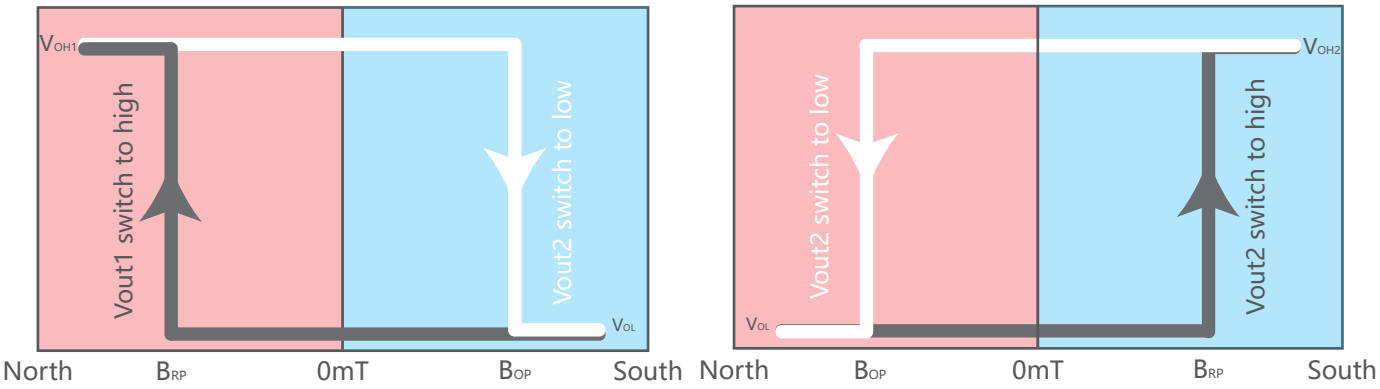
10 Magnetic Behavior

South Pole Active

When the “S” pole faces the sensor’s mark surface and is closed to it (B ≥ Bop), the terminal V_{O1} outputs a low level and the terminal V_{O2} a high level; when the “N”pole faces senosor’s mark surface and is closed to it (B ≤ Brp), terminal V_{O1} outputs a high level and the terminal V_{O2} a low level. Stable hysteresis (Bh = Bop - Brp) ensures stable switch status. The magnetoelectric conversion characteristics of AH4059 are shown in the figure:



Bipolar Dual Output

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11 Package Information

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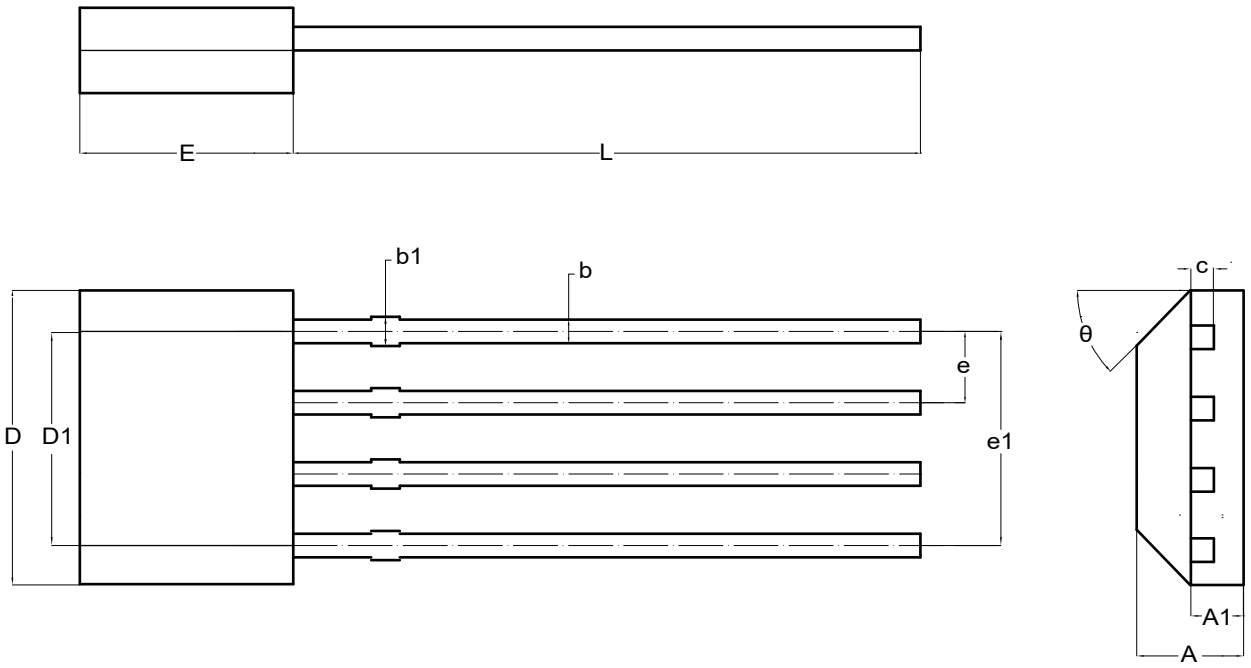

Symbol	Dimension (Unit: mm)	
	Min.	Max.
A	1.400	1.800
A1	0.700	0.900
b	0.360	0.500
b1	0.380	0.550
c	0.360	0.510
D	4.980	5.280
D1	3.780	4.080
E	3.450	3.750
e	1.270TYP.	
e1	3.710	3.910
L	14.900	15.300
θ	45°TYP.	

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12 Marking Information