

1 Features and Benefits

- ▲ Operating voltage range: 3.5 ~ 6.5V
- ▲ Rated output current: 6 mA
- ▲ Stable switching signal without mechanical contact and spark
- ▲ High reliability and safety without shaking moment
- ▲ TO-92UA and SOT23-3L package options
- ▲ Developed according to the EU RoHS and REACH

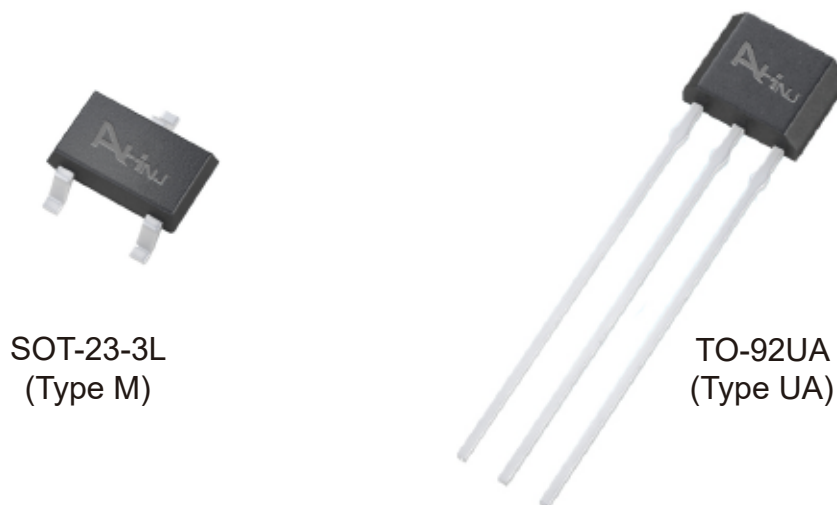
2 Application Examples

- ▲ Automotive electronics, Consumer electronics and Industrial electronics
- ▲ Brake light wake-up switch
- ▲ Electronic steering column lock
- ▲ Door latch system
- ▲ BLDC Encoder
- ▲ Sunroof/Tailgate opener
- ▲ Transmission applications
- ▲ Electrical power steering

3 Selection Guide

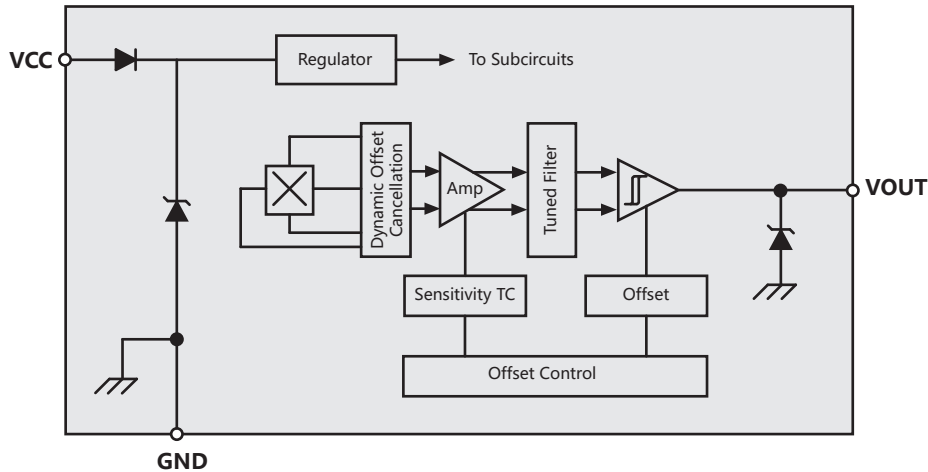
| Part Number | Packing | Mounting | Operating, T | S(Min) | S(Max) |
|-------------|------------------------------|------------------------------|----------------|---------|---------|
| AH3503/E-UA | Bulk, 1000 pieces/bag | 3-pin SIP through hole | -40°C to 85°C | 12mV/mT | 17mV/mT |
| AH3503/E-M | 7-in. reel, 3000 pieces/reel | 3-pin SOT23-3L surface mount | -40°C to 85°C | 12mV/mT | 17mV/mT |
| AH3503/K-UA | Bulk, 1000 pieces/bag | 3-pin SIP through hole | -40°C to 125°C | 12mV/mT | 17mV/mT |
| AH3503/K-M | 7-in. reel, 3000 pieces/reel | 3-pin SOT23-3L surface mount | -40°C to 125°C | 12mV/mT | 17mV/mT |

NOTE 1. Hall ICs are soldered tin brazing for assembly, and wave soldering of SOT-23-3L surface-mounted components poses a risk of failure.
 2. A risk of circuit failure may happen in non-brazing processes such as electric resistance welding, high-frequency welding, etc.
 3. E: -40~85°C; K: -40~125°C; L: -40~150°C.



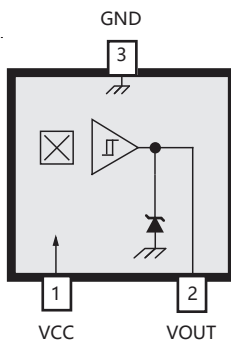
4 General Description

The AH3503 is an analog signal output Hall IC, the output voltage changes with the changes of magnetic field. It has built-in circuit units such as reverse voltage protector, voltage regulator, temperature compensation circuit, Hall voltage generator, signal amplifier, etc. The high performance voltage regulator and temperature compensation circuit ensure that the sensor operates steadily over the operating temperatures range, and the reverse voltage protection circuit prevents the sensor from being damaged by the reverse voltage. The AH3503 is produced with bipolar technology. It is available in two package types: SOT-23-3L (Type M), and TO-92UA (Type UA). Each package is lead (Pb) free, with 100% matte tin plated leadframes.

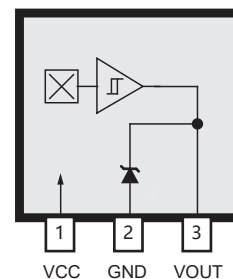


5 Terminal List

SOT-23-3L
(Type M)



TO-92UA
(Type UA)



| Name | Description | Number | |
|------|-------------------------------|-----------|------------|
| | | Package M | Package UA |
| VCC | Connects power supply to chip | 1 | 1 |
| GND | Ground | 2 | 2 |
| VOUT | Output | 3 | 3 |

6 Absolute Maximum Ratings

| Characteristic | Symbol | Note | Rating | Unit |
|------------------------------|---------------|--|------------|------|
| Supply Voltage | V_{CC} | | 11 | V |
| Reverse Supply Voltage | V_{RCC} | | -0.5 | V |
| Maximum Output Voltage | V_{OUTmax} | test at 11V Supply Voltage | 10.95 | V |
| Minimum Output Voltage | V_{OUTmin} | test at 11V Supply Voltage | 0.02 | V |
| Output Current | $I_{OUTSINK}$ | | 1 | mA |
| Magnetic Flux Density | B | | Unlimited | G |
| Operating Temperature | T_A | E | -40 to 85 | °C |
| Operating Temperature | T_A | K | -40 to 125 | °C |
| Maximum Junction Temperature | $T_{J(max)}$ | Too high a T_J could lead to electrical or thermal breakdown | 165 | °C |
| Storage Temperature | T_{stg} | | -50 to 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, $T_J < 165^\circ\text{C}$ | 3.5 | - | 6.5 | V |
| Null Voltage | V_{OH} | $V_{CC}=5\text{V}$, no load on VOUT | 2.3 | - | 2.7 | V |
| Output Voltage | V_{OL} | $V_{CC}=5\text{V}$, $I_{OUTMAX}=1.0\text{mA}$ | 0.1 | - | 4.9 | V |
| Supply Current | I_{CC} | $V_{CC}=5\text{V}$ | - | 4.5 | 7 | mA |

8 Magnetic Operating Characteristics

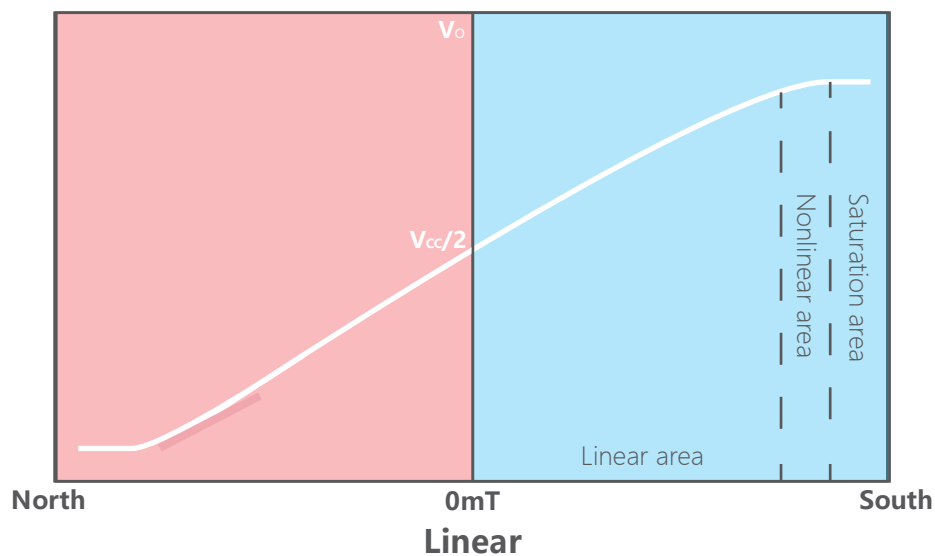
valid through the full operating temperature range; unless otherwise specified

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|---------------|---|------|-------|------|-------|
| Sensitivity | S | $V_{CC}=5\text{V}$, $T_A=25^\circ\text{C}$ | 12 | 15.25 | 17 | mV/mT |
| Sensitivity Tolerance | ΔS | — | -10 | - | +10 | % |
| Ratiometry V_{NULL} | $V_{NULL}(V)$ | — | -5 | - | +5 | % |
| Linearity | L | — | -2.5 | - | +2.5 | % |
| Linear Area | LIN | — | -80 | - | +80 | mT |

9 Magnetic Behavior

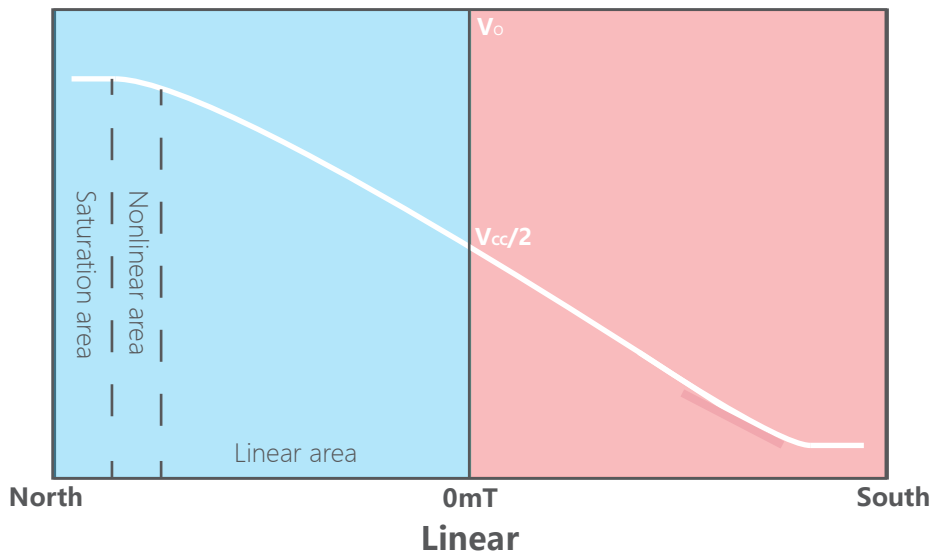
Vo raises with increasing B (S pole)

The sensor will pass linear area /nonlinear area/ saturation area during the magnetic induction increases. When there is no magnetic field that applies in sensor ($B=0$), the output voltage of sensor is only half of V_{CC} ($V_{CC}/2$); when N pole faces mark surface of the sensor and is close to it gradually ($B \rightarrow -\infty$), the output voltage begins to decrease, and the voltage doesn't reduce with the increased magnetic field after it reaches saturation voltage; When the S pole of magnet faces the mark surface of the sensor and is closed to it gradually ($B \rightarrow +\infty$), the output voltage of sensor begins to increase, and it doesn't increase with the increased magnetic field after it reaches saturation voltage. The magnetolectric conversion characteristics of AH3503 are shown in the figure:

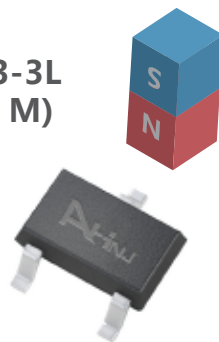


Vo raises with increasing B (N pole)

The sensor will pass linear area /nonlinear area/ saturation area during the magnetic induction increases. When there is no magnetic field that applies in sensor ($B=0$), the output voltage of sensor is only half of V_{cc} ($V_{cc}/2$); when S pole faces mark surface of the sensor and is close to it gradually ($B \rightarrow -\infty$), the output voltage begins to decrease, and the voltage doesn't reduce with the increased magnetic field after it reaches saturation voltage; When the N pole of magnet faces the mark surface of the sensor and is closed to it gradually ($B \rightarrow +\infty$), the output voltage of sensor begins to increase, and it doesn't increase with the increased magnetic field after it reaches saturation voltage. The magnetolectric conversion characteristics of AH3503 are shown in the figure:

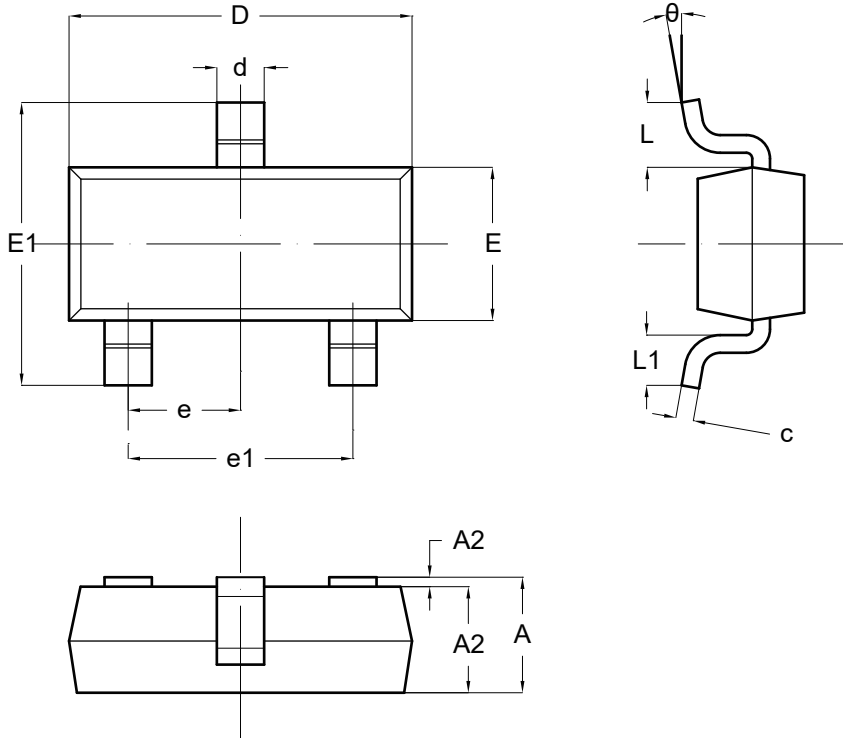


SOT-23-3L
(Type M)



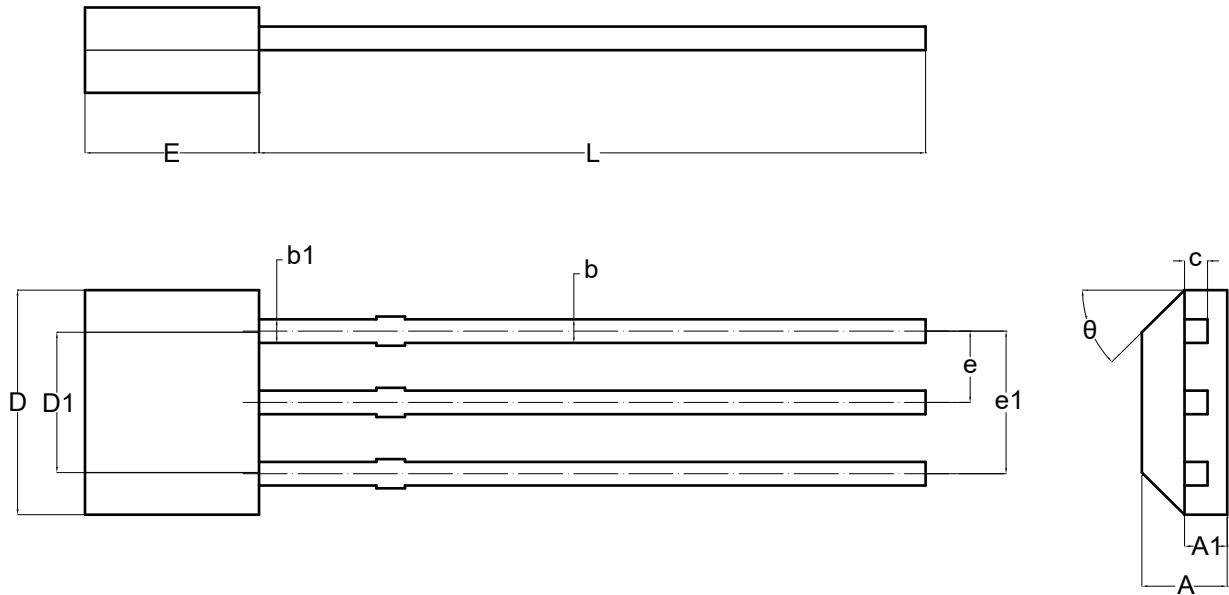
10 Package Information

SOT-23-3L



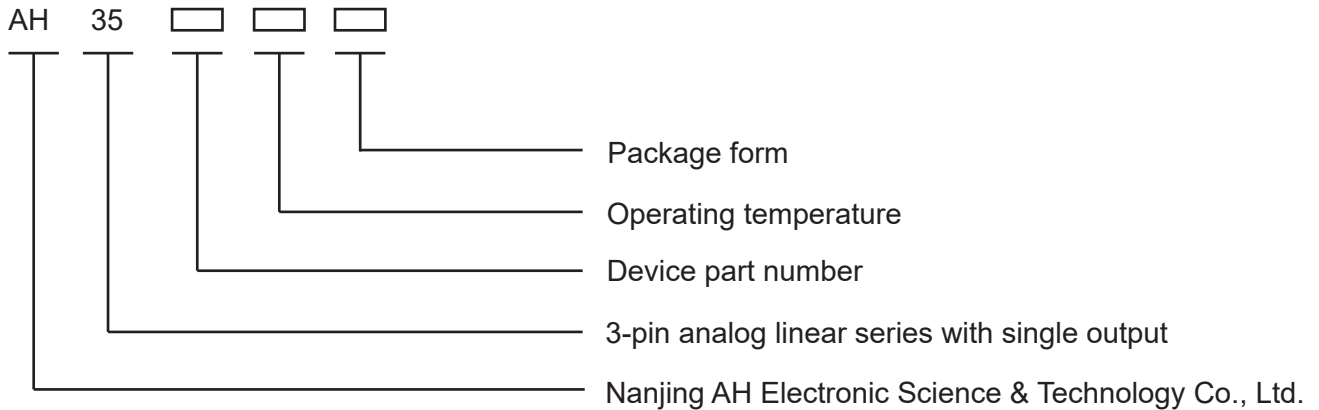
| Symbol | Dimension (Unit: mm) | |
|----------|----------------------|-------|
| | Min | Max |
| A | 1.050 | 1.250 |
| A1 | 0.000 | 0.100 |
| A2 | 1.050 | 1.150 |
| b | 0.300 | 0.500 |
| c | 0.100 | 0.200 |
| D | 2.820 | 3.020 |
| E | 1.500 | 1.700 |
| E1 | 2.650 | 2.950 |
| e | 0.950BSC. | |
| e1 | 1.800 | 2.000 |
| L | 0.550REF. | |
| L1 | 0.300 | 0.600 |
| θ | 0° | 8° |

TO-92UA



| Symbol | Dimension (Unit: mm) | |
|----------|----------------------|--------|
| | Min | Max |
| A | 1.420 | 1.620 |
| A1 | 0.660 | 0.860 |
| b | 0.330 | 0.480 |
| b1 | 0.400 | 0.510 |
| c | 0.330 | 0.510 |
| D | 3.900 | 4.100 |
| D1 | 2.280 | 2.680 |
| E | 3.050 | 3.250 |
| e | 1.270TYP. | |
| e1 | 2.440 | 2.640 |
| L | 14.350 | 14.750 |
| θ | 45°TYP. | |

12 Marking Information



- Package Form:

M — SOT-23-3L (SMD)

S — SOT-89 (SMD)

UA — TO-92UA/TO-92S (SIP)

Note: M and S type are packed in reels, M 3k/reel, S 1k/reel;

UA type is packed in bags of 1k/bag or 0.5k/bag.

- Operating Temperature:

E — -40°C ~ +85°C

L — -40°C ~ +150°C

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