

## 1 Features and Benefits

- ▲ High sensitivity digital output
- ▲ Stable over the entire temperature range
- ▲ Wide operating voltage range: 4.5V ~ 24V
- ▲ Strong resistance to mechanical stress
- ▲ Reverse power supply protection
- ▲ Non-contact output, safety and reliable
- ▲ TO-92UA, SOT-23-3L and SOT-89 package options
- ▲ Developed according to the EU RoHS and 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, T	B <sub>RP</sub> (Min)	B <sub>OP</sub> (Max)
AH3131/K-M	7-in. reel, 3000 pieces/reel	3-pin SOT23-3L surface mount	-40°C to 125°C	1.0mT	6.0mT
AH3131/L-UA	Anti-static bag, 500 pieces/bag	3-pin SIP through hole	-40°C to 150°C	1.0mT	6.0mT
AH3131/L-S	7-in. reel, 1000 pieces/reel	3-pin SOT89 surface mount	-40°C to 150°C	1.0mT	6.0mT

NOTE 1. 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.

2. A risk of circuit failure may happen in non-brazing processes such as electric resistance welding, high-frequency welding, etc.

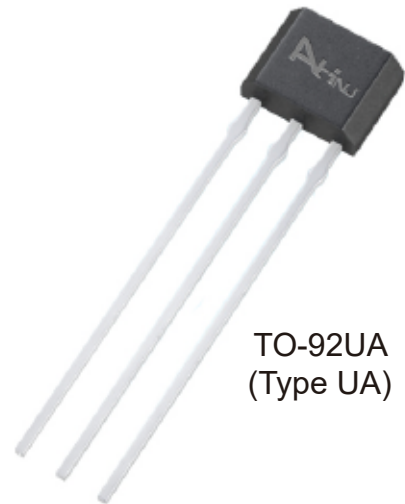
3. E: -40~85°C; K: -40~125°C; L: -40~150°C.



SOT-23-3L  
(Type M)



SOT-89  
(Type S)



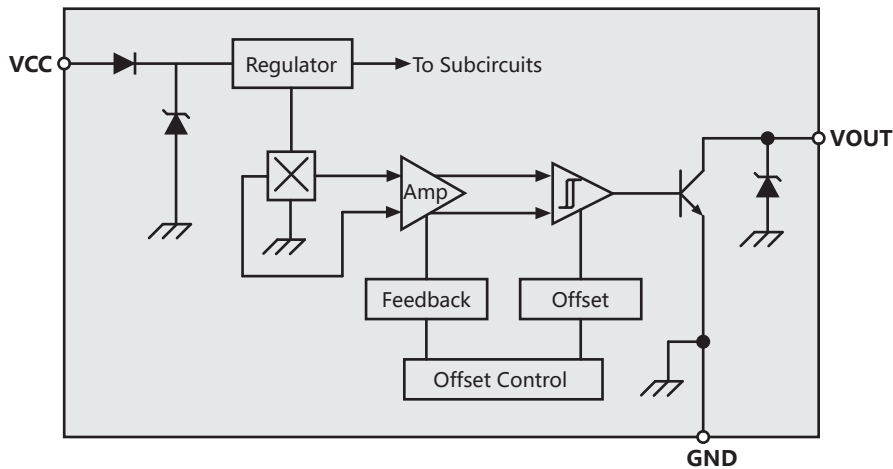
TO-92UA  
(Type UA)

## 4 General Description

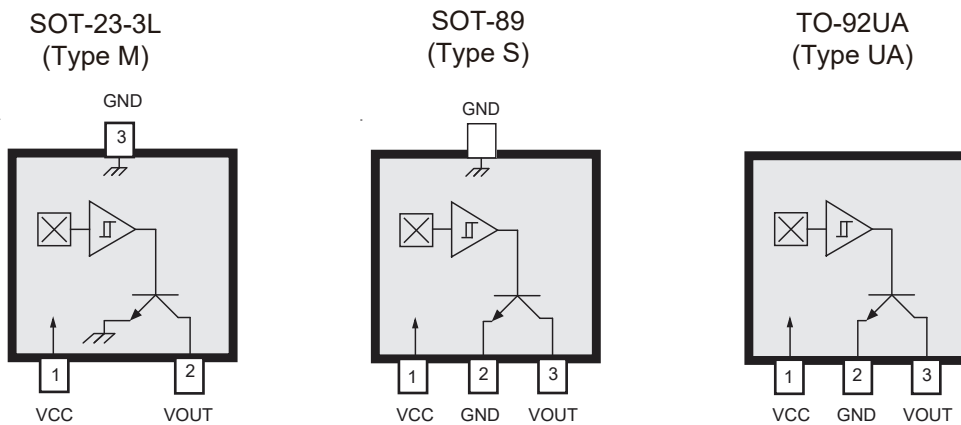
The AH3131 is a high sensitivity digital unipolar Hall IC with single output.

The AH3131 Hall-effect sensor includes the following on a single silicon chip: reverse voltage protector, voltage regulator, temperature compensation circuit, Hall-voltage generator, signal amplifier, Schmitt trigger and open-collector output driver, etc. The integrated voltage regulator and temperature compensation circuit ensure that the sensor works stably in a wide voltage and temperature range. The reverse voltage protection circuit prevents the sensor from being damaged by reverse voltage.

The AH3131, produced with bipolar technology, is more stable and reliable. It is available in three package types: SOT-23-3L (Type M), SOT-89 (Type S), and TO-92UA (Type UA). Each package is lead (Pb) free, with 100% matte tin plated leadframes.



## 5 Terminal List



Name	Description	Number		
		Type M	Type S	Type UA
VCC	Power Supply	1	1	1
GND	Ground	3	2	2
VOUT	Output	2	3	3

## 6 Absolute Maximum Ratings

Characteristic	Symbol	Note	Rating	Unit
Supply Voltage	$V_{CC}$		28	V
Reverse Supply Voltage	$V_{RCC}$		-22	V
Output Off Voltage	$V_{OUT}$		28	V
Reverse Output Voltage	$V_{ROUT}$		-0.5	V
Output Current	$I_{OUTSINK}$		50	mA
Magnetic Flux Density	$B$		Unlimited	G
Operating Temperature	$T_A$	L	-40 to 150	°C
Operating Junction 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, $T_J < 165^\circ\text{C}$	4.5	-	24	V
High-level Output Voltage	$V_{OH}$	$V_{CC}=24\text{V}$ , $R_L=10\text{k}\Omega$ , $B < B_{RP}$	23.5	-	24	V
Low-level Output Voltage	$V_{OL}$	$I_{OUTMAX}=25\text{mA}$ , $B > B_{OP}$	0	-	0.5	V
Supply Current	$I_{CC}$	$V_{CC}=24\text{V}$	-	4.0	8.0	mA
Output leakage Current	$I_{OUTOFF}$	$V_{OUT}=24\text{V}$ , $B < B_{RP}$	-	-	10	$\mu\text{A}$
Power-On Time	$t_{PO}$		-	-	30	$\mu\text{s}$
Output-Rise Time	$t_R$	$V_{CC}=12\text{V}$ , $R_L=1.2\text{k}\Omega$ , $C=12\text{pF}$	-	-	2	$\mu\text{s}$
Output-Fall Time	$t_F$	$V_{CC}=12\text{V}$ , $R_L=1.2\text{k}\Omega$ , $C=12\text{pF}$	-	-	2	$\mu\text{s}$

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

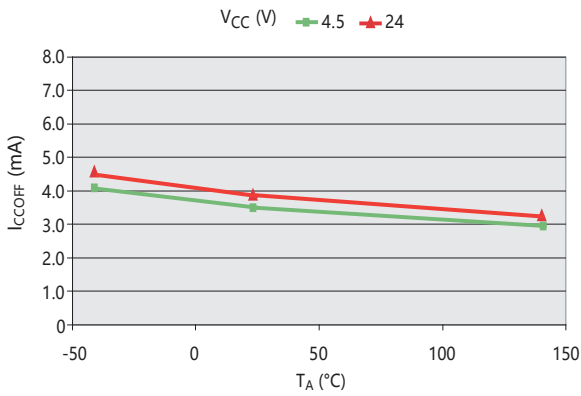
## 8 Magnetic Operating Characteristics

valid through the full operating temperature range; unless otherwise specified

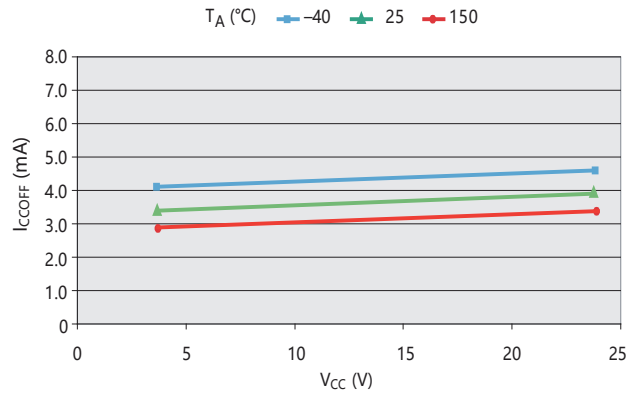
Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Point	$B_{OP}$	Operating, $T_J < 165^\circ\text{C}$	-	3.0	6.0	mT
Release Point	$B_{RP}$	$V_{CC}=24\text{V}$ , $R_L=10\text{k}\Omega$ , $B < B_{RP}$	1.0	1.5	-	mT
Hysteresis	$B_H$	$I_{OUT}=25\text{mA}$ , $B > B_{OP}$	-	1.5	-	mT

## 9 Characteristic Curves (Type UA)

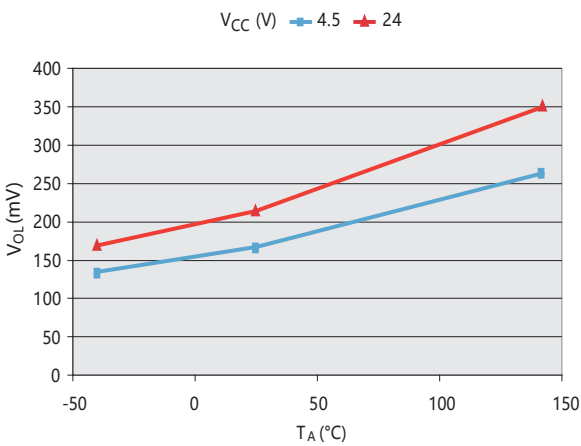
Supply Current (Off) versus Ambient Temperature



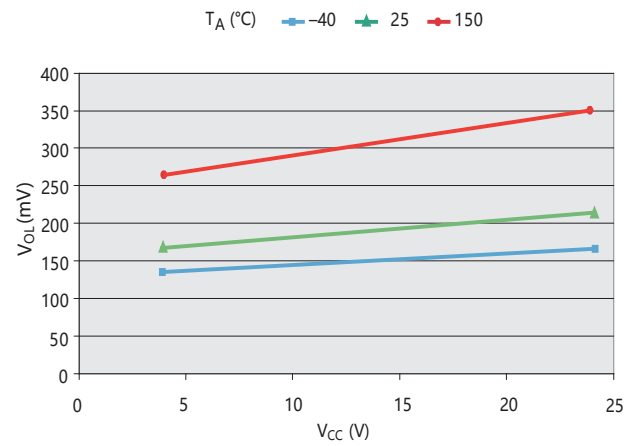
Supply Current (Off) versus Supply Voltage



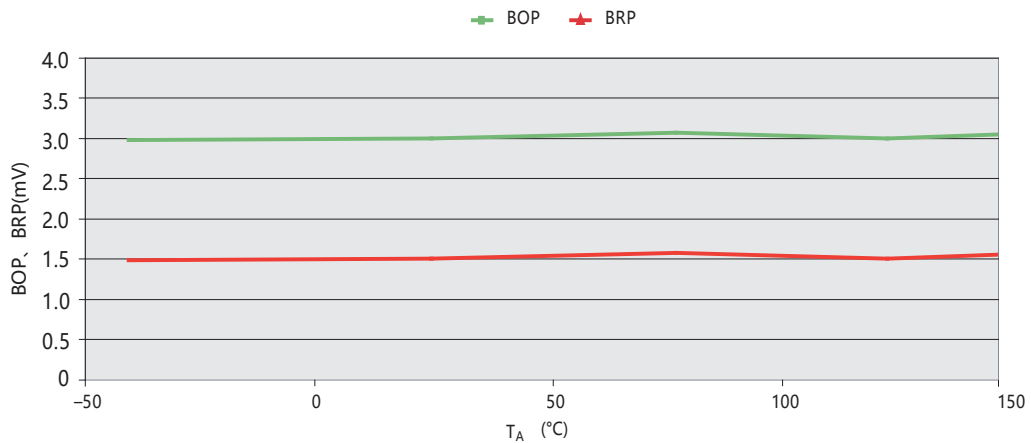
Low-level Output (On) versus Ambient Temperature



Low-level Output (On) versus Supply Voltage



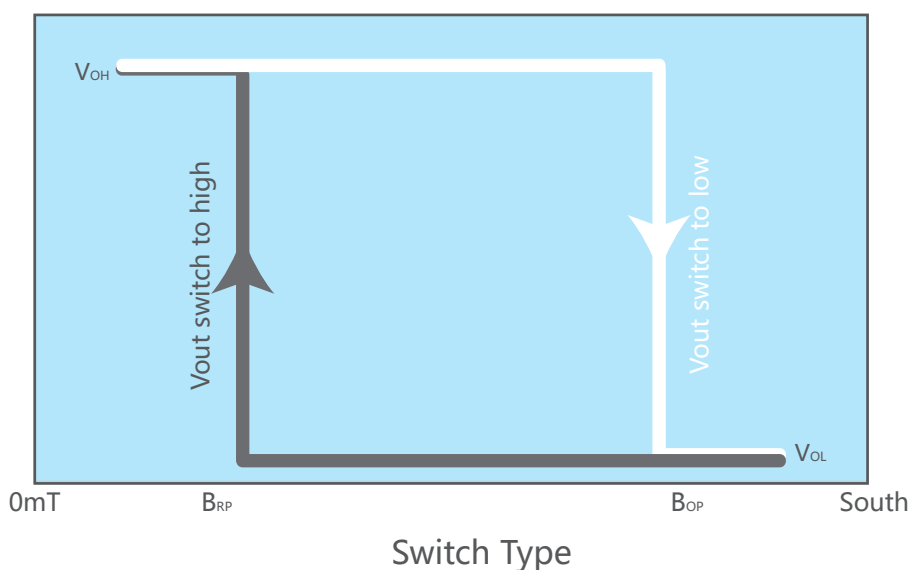
Operating and Release Point versus Ambient Temperature



## 10 Magnetic Behavior

### South Pole Active

When the S pole of the magnet faces the mark surface of the sensor and is close to it ( $B \geq B_{OP}$ ), the sensor outputs a low level; when the S pole is away from the sensor ( $B \leq B_{RP}$ ), it outputs a high level. The sensor does not respond when the N pole faces its mark surface. The stable hysteresis ( $B_H = |B_{OP} - B_{RP}|$ ) ensures that the sensor switch is stable. The magnetoelectric conversion characteristics of AH3131 are shown in the figure:



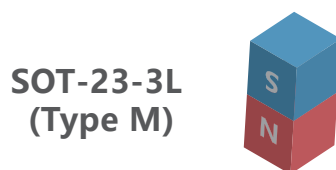
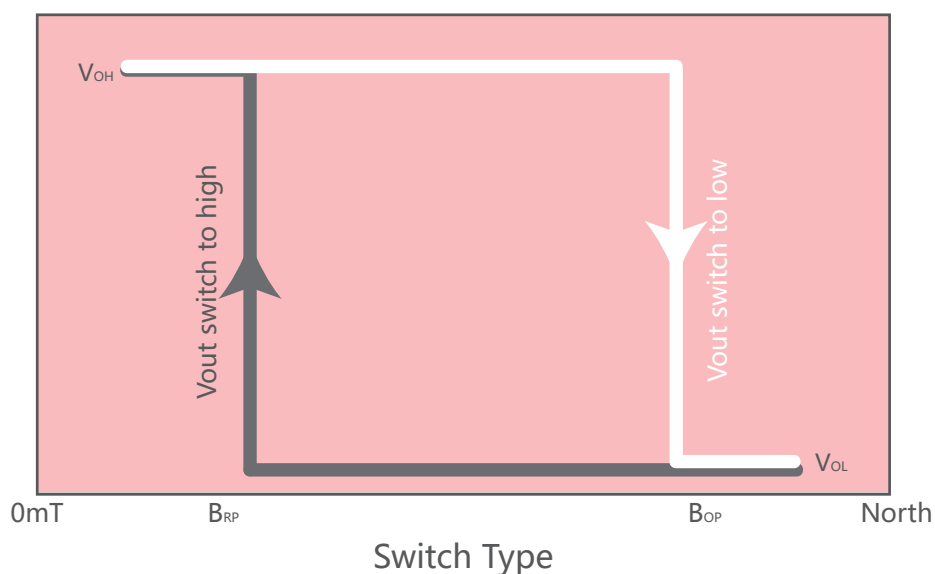
**South Pole Active**



**South Pole Active**

### North Pole Active

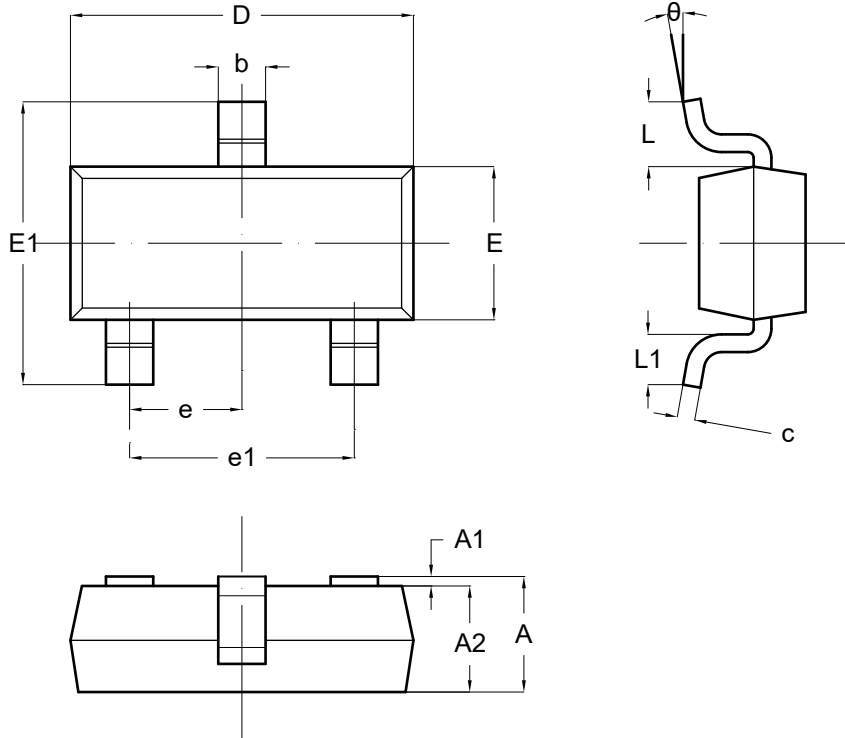
When the N pole of the magnet faces the mark surface of the sensor and is close to it ( $B \geq B_{OP}$ ), the sensor outputs a low level; when the N pole is away from the sensor ( $B \leq B_{RP}$ ), it outputs a high level. The sensor does not respond when the S pole faces its mark surface. The stable hysteresis ( $B_H = |B_{OP} - B_{RP}|$ ) ensures that the sensor switch is stable. The magnetoelectric conversion characteristics of AH3131 are shown in the figure:



North Pole Active

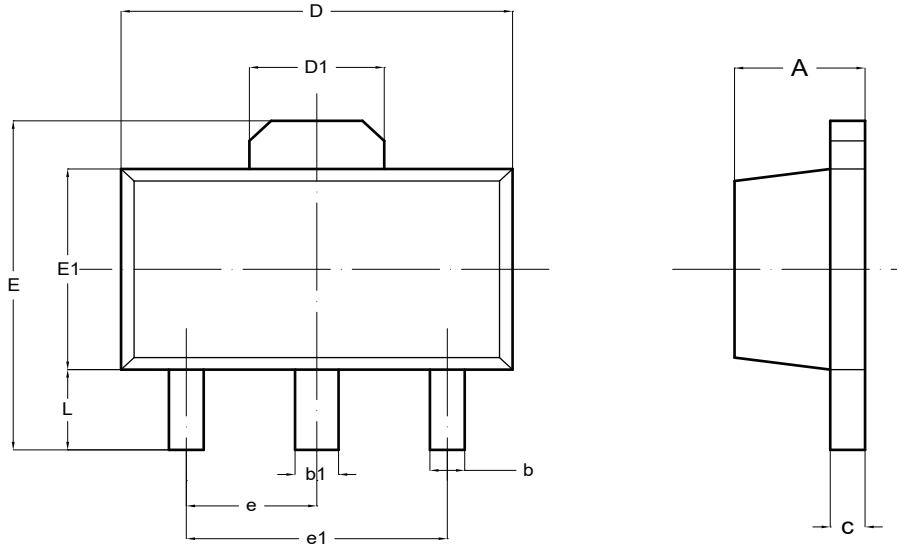
## 11 Package Information

### 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
$\theta$	0°	8°

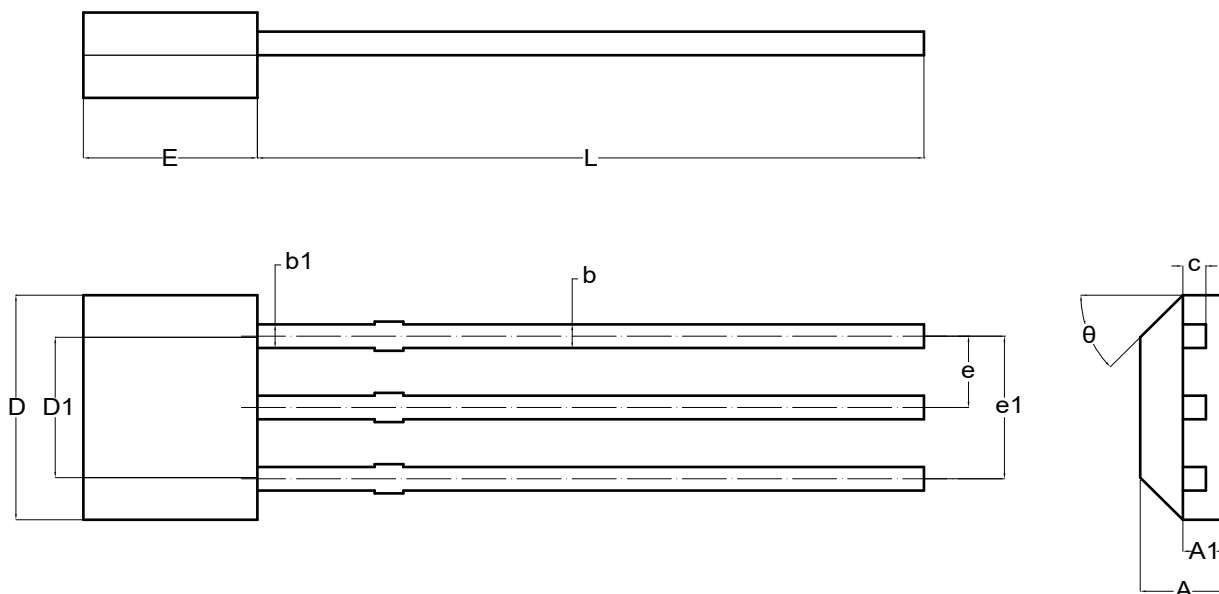
## SOT-89



Symbol	Dimension (Unit: mm)	
	Min	Max
A	1.400	1.600
b	0.320	0.520
b1	0.380	0.580
c	0.350	0.440
D	4.400	4.600
D1	1.550REF.	
E	3.940	4.250
E1	2.300	2.600
e	1.500TYP.	
e1	3.000TYP.	
L	0.900	1.200

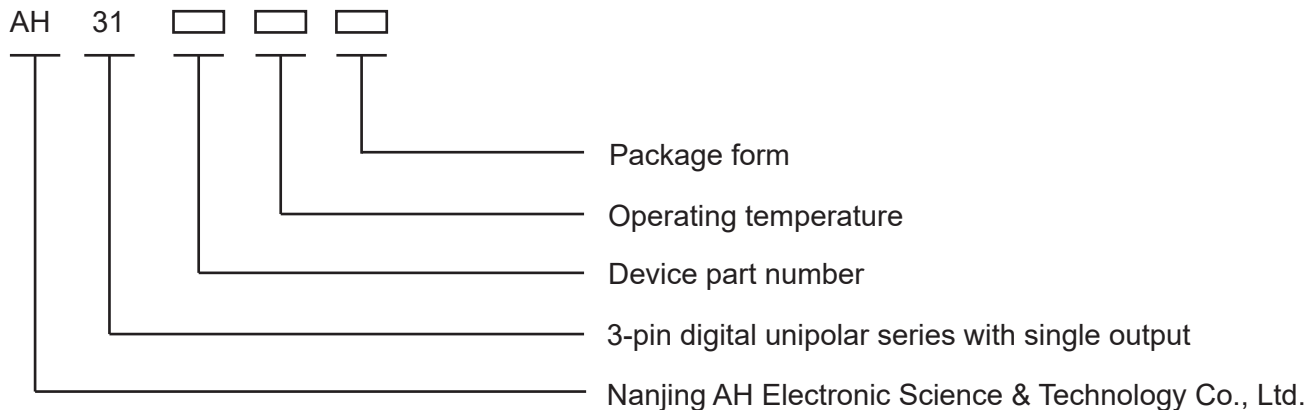


## TO-92UA



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
$\theta$	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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