



## 概述

AH402F是一款耐高压双极霍尔开关芯片，采用高压bipolar工艺制程。该芯片内部由电压稳压单元、霍尔电压发生器、差分放大电路、温度补偿电路、集电极开路输出电路组成。工作形式：输入磁感应强度，输出为数字电压信号。该芯片具有可耐高电压冲击，具有极强的抗噪能力；适用于各种电子消费类、汽车和工业控制等领域。提供 TO-92S 和 SOT-23-3L 两种封装形式，且封装都符合RoHS标准。

## 特征

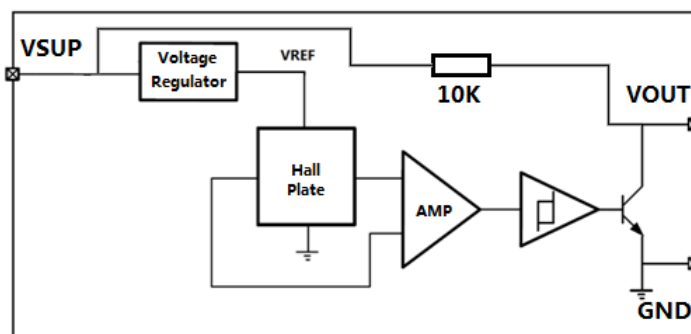
- 工作电压：3.8V~60V
- 过压保护能力：80V
- ESD 性能：±4 kV
- 输出内置 10KΩ上拉电阻
- 工作温度范围：-40°C~150°C

## 典型应用

- 无刷直流电机换向
- 速度测量
- 计数
- 角位置检测
- 接近检测

## 功能框图

该磁传感器包括电压调制电路、霍尔片、信号放大电路和施密特触发器电路。其中，电压调制电路为霍尔片提供参考电压，该霍尔片感应到垂直于传感器表面的磁场产生霍尔电压，放大后发送给施密特触发器。同时，芯片内部集成了输出上拉电阻。



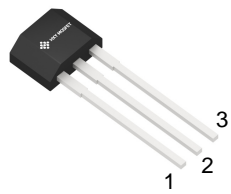
AH402F 功能框图



## 引脚信息



SOT-23/23-3L



TO-92S

| 芯片引脚号 | 名称   | 说明                  |
|-------|------|---------------------|
| 1     | VSUP | 电源                  |
| 2     | GND  | 地                   |
| 3     | VOUT | 集电极开路输出，<br>需外接上拉电阻 |

## 订购信息

| 编号       | 封装        | 包装     | 工作温度范围      |
|----------|-----------|--------|-------------|
| AH402FUA | TO-92S    | 1000/袋 | -40°C~150°C |
| AH402FSU | SOT-23-3L | 3000/盘 | -40°C~150°C |

## 绝对最大额定

| 符号        | 参数   | 最小值  | 最大值 | 单位 |
|-----------|------|------|-----|----|
| $V_{SUP}$ | 电源电压 | -0.5 | 80  | V  |
| $V_{OUT}$ | 输出电压 | -0.5 | 80  | V  |
| $I_{OUT}$ | 输出电流 | 0    | 40  | mA |
| $T_J$     | 工作温度 | -40  | 150 | °C |
| $T_{STG}$ | 存储温度 | -50  | 165 | °C |

绝对最大额定值是芯片所能承受的极限值，超过该值芯片可能会永久损坏。



## 电磁特性

测试条件： $T_J = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$ ， $V_{\text{SUP}} = 3.8\text{V} \sim 60\text{V}$ ；典型值测试条件： $T_J = 25^{\circ}\text{C}$ ， $V_{\text{SUP}} = 5\text{V}$ 。

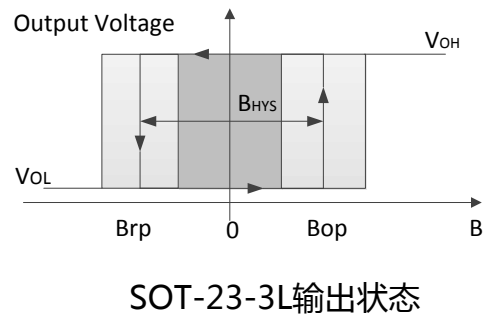
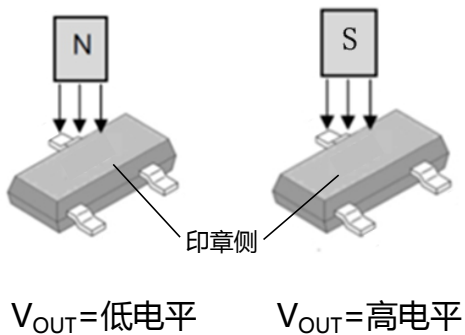
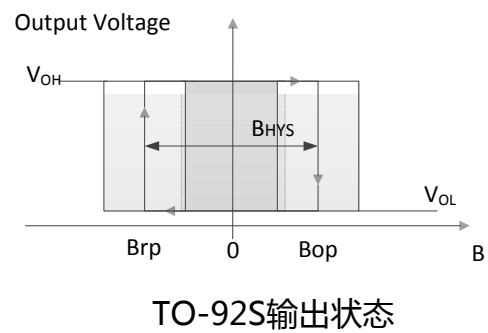
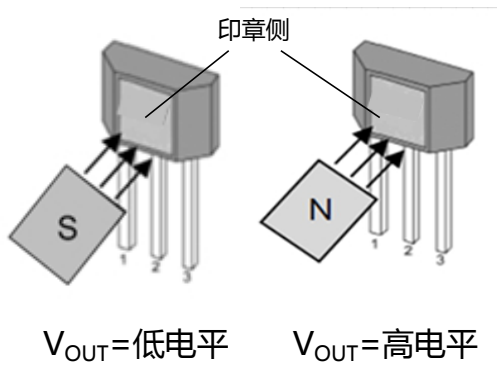
| 符号                | 参数     | 测试条件                           | 最小值 | 典型值 | 最大值 | 单位    |
|-------------------|--------|--------------------------------|-----|-----|-----|-------|
| <b>电特性</b>        |        |                                |     |     |     |       |
| $V_{\text{SUP}}$  | 电源电压   |                                | 3.8 |     | 60  | V     |
| $I_{\text{SUP}}$  | 电源电流   |                                |     | 4.8 | 8   | mA    |
| $I_{\text{leak}}$ | 输出漏电流  |                                |     |     | 10  | uA    |
| $V_{\text{sat}}$  | 输出电压   | $I_{\text{OUT}} = 20\text{mA}$ |     |     | 0.4 | V     |
| $I_{\text{OUT}}$  | 输出电流   |                                |     |     | 30  | mA    |
| $T_r$             | 输出上升时间 | $C_L = 20\text{pF}$            |     |     | 1.0 | us    |
| $T_f$             | 输出下降时间 | $C_L = 20\text{pF}$            |     |     | 1.5 | us    |
| <b>磁特性</b>        |        |                                |     |     |     |       |
| $B_{\text{op}}$   | 工作点    | $C_L = 20\text{pF}$            | 10  | 25  | 40  | Gauss |
| $B_{\text{rp}}$   | 释放点    | $C_L = 20\text{pF}$            | -40 | -25 | -10 | Gauss |
| $B_{\text{HYS}}$  | 回差     |                                |     | 90  |     | Gauss |



## 磁电转换说明

在 TO-92S 封装的印章侧施加大于 $B_{op}$ 的磁场（南极靠近），输出变为低电平；施加小于 $B_{rp}$ 的磁场（北极靠近），输出变为高电平。芯片初次上电时，如果磁场处于 $B_{op}$ 和 $B_{rp}$ 之间，输出状态会处于未定义的状态（高电平或低电平）。SOT-23-3L 封装的工作点与释放点的磁场极性与 TO-92S 相反。

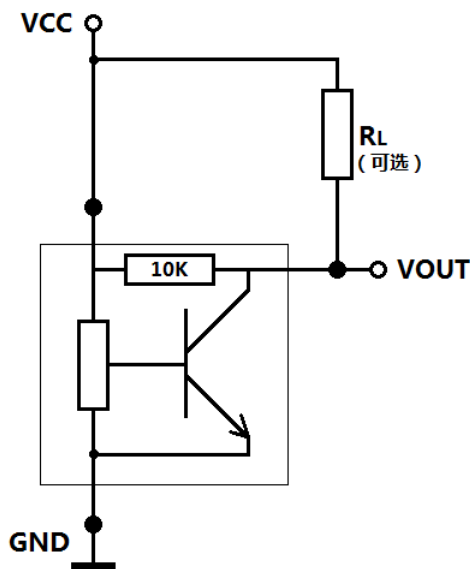
见下图。



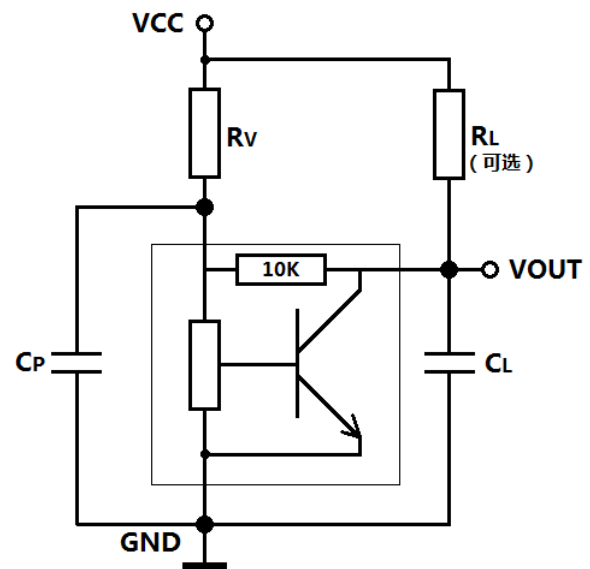


## 应用电路

典型应用电路见下图中应用电路1，其中RL可选。对于供电线上具有干扰或辐射干扰的应用，建议将串联电阻R<sub>v</sub>和两个电容C<sub>p</sub>尽量放置在接近传感器处，见下图中应用电路2，其中R<sub>v</sub>=100 Ω，C<sub>p</sub>=4.7nF，C<sub>L</sub>=1nF，RL可选。



应用电路 1



应用电路 2

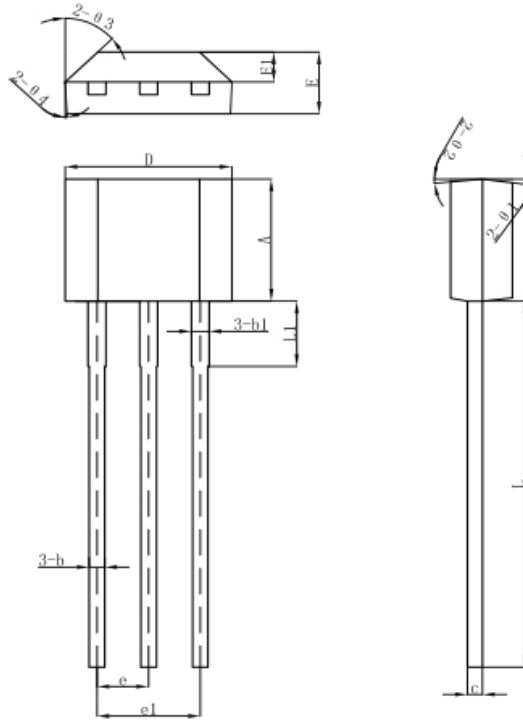
## 注意事项

- 霍尔芯片是敏感器件，在使用及存储过程中应注意采取静电防护措施。
- 在安装使用中应尽量减少施加到器件外壳和引线上的机械应力。
- 建议焊接温度不超过 350°C，持续时间不超过 5 秒。
- 为保证霍尔芯片的安全性和稳定性，不建议长期超出参数范围使用。



## 外形尺寸

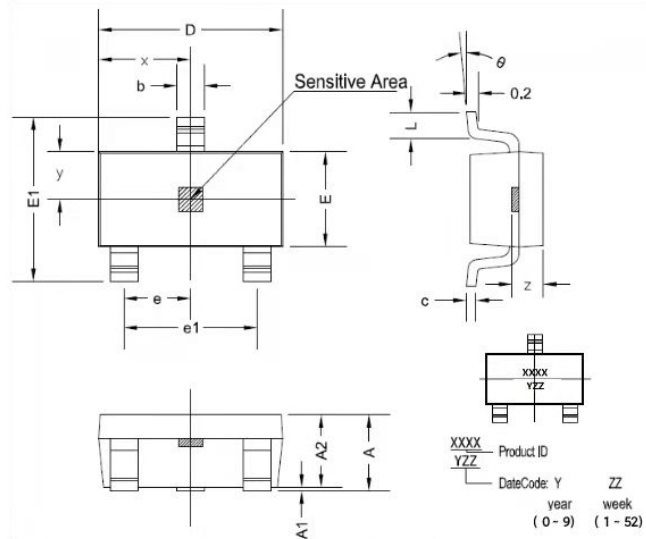
### TO-92S 封装尺寸



| 符号        | 机械尺寸/mm |       |       |
|-----------|---------|-------|-------|
|           | 最小      | 典型    | 最大    |
| A         | 2.90    | 3.00  | 3.10  |
| b         | 0.35    | 0.39  | 0.40  |
| b1        |         | 0.44  |       |
| c         | 0.36    | 0.38  | 0.40  |
| D         | 4.00    | 4.10  | 4.20  |
| E         | 1.42    | 1.52  | 1.62  |
| E1        |         | 0.75  |       |
| e         |         | 1.27  |       |
| e1        |         | 1.27  |       |
| L1        |         | 2.54  |       |
| L         | 13.50   | 14.50 | 15.50 |
| $\theta1$ |         | 6°    |       |
| $\theta2$ |         | 3°    |       |
| $\theta3$ |         | 45°   |       |
| $\theta4$ |         | 3°    |       |
| h         |         | 3.6   |       |



SOT-23-3L 封装尺寸



| 符号 | 尺寸 (毫米)   |      | 尺寸 (英尺)   |       |
|----|-----------|------|-----------|-------|
|    | 最小        | 最大   | 最小        | 最大    |
| A  | 1.05      | 1.25 | 0.041     | 0.049 |
| A1 | 0         | 0.1  | 0         | 0.004 |
| A2 | 1.05      | 1.15 | 0.041     | 0.045 |
| b  | 0.3       | 0.5  | 0.012     | 0.02  |
| c  | 0.100     | 0.2  | 0.004     | 0.008 |
| D  | 2.82      | 3.02 | 0.111     | 0.119 |
| E  | 1.5       | 1.7  | 0.059     | 0.067 |
| E1 | 2.65      | 2.95 | 0.104     | 0.116 |
| e  | 0.950 TYP |      | 0.037 TYP |       |
| e1 | 1.8       | 2    | 0.071     | 0.079 |
| L  | 0.3       | 0.6  | 0.012     | 0.024 |
| x  | 1.460 TYP |      | 0.057 TYP |       |
| y  | 0.800 TYP |      | 0.032 TYP |       |
| z  | 0.600 TYP |      | 0.024 TYP |       |
| θ  | 0°        | 8°   | 0°        | 8°    |



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