# Two Phase Dual-coil High Voltage Smart Fan Motor Driver with FG/RD AH9281/82

## General Description

The AH9281/82 is a one-chip solution for driving two-coil brushless DC motors and fans.

Based on the advanced CDMOS process, the IC contains a Hall-effect sensor, dynamic offset correction and powerful output drivers with 1200mA peak output current capability.

Specially designed for driving large fans, the device is optimized for low start-up voltage. Frequency Generator or Rotation Detection is available. The open drain output makes easier the connectivity with any external interface such as hardware monitoring or Super I/O IC.

The AH9281/82 is available in TO-95 and SOT-89-5 packages.

## Features

- High Sensitivity Integrated Hall Sensor
- Low Start-up Voltage
- 5V and 12V Operation
- Peak Output Current up to 1200mA
- Power Efficient CMOS and Power MOSFETs
- Built-in Output Protection Clamping Diode
- Locked Rotor Shutdown and Auto-restart
- Integrated Tachometer (AH9281) or Alarm (AH9282) Signal Output
- ESD Rating: 6000V (Human Body Model)
  400V (Machine Model)

## Applications

- 5V/12V DC Brushless Motor/Fan
- PC, Server, Laptop Cooling Fan
- Power Supply Cooling Fan
- Large or Small Fans

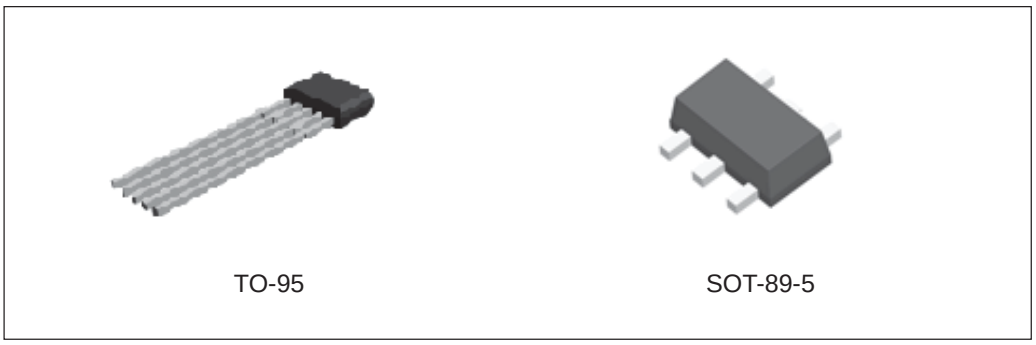



Figure 1. Package Types of AH9281/82

## Pin Configuration

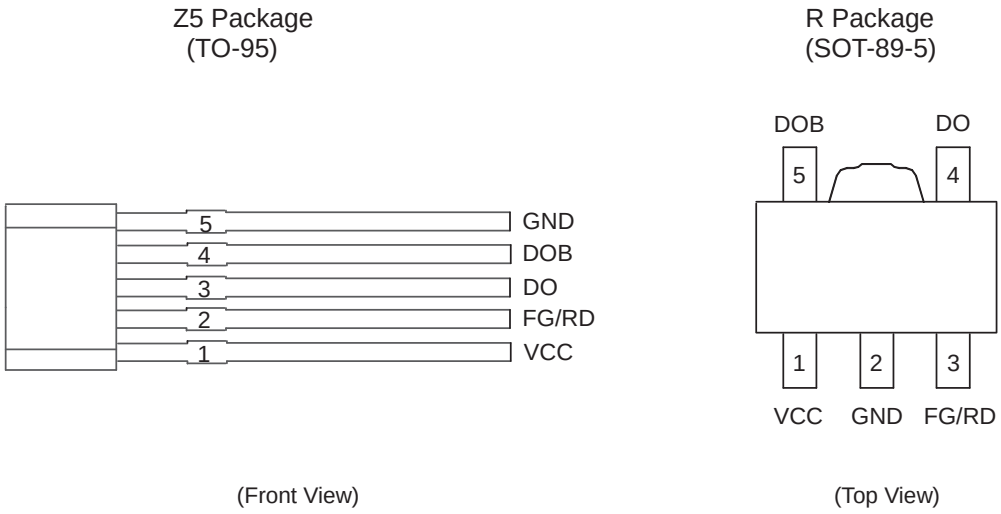
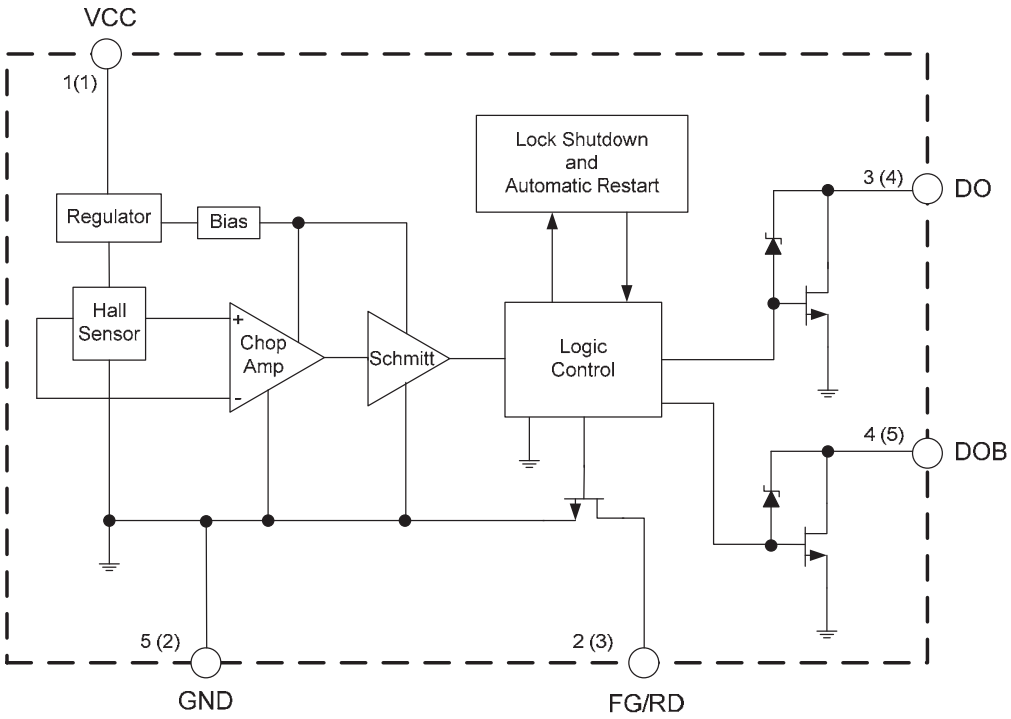



Figure 2. Pin Configuration of AH9281/82

## Pin Description

| Pin Number | | Pin Name | Function |
|---|---|---|---|
| TO-95 | SOT-89-5 | | |
| 1 | 1 | VCC | Power supply pin |
| 2 | 3 | FG/RD | Frequency Generator (Rotation Detection) open drain output |
| 3 | 4 | DO | Output pin 1 |
| 4 | 5 | DOB | Output pin 2 |
| 5 | 2 | GND | Ground pin |

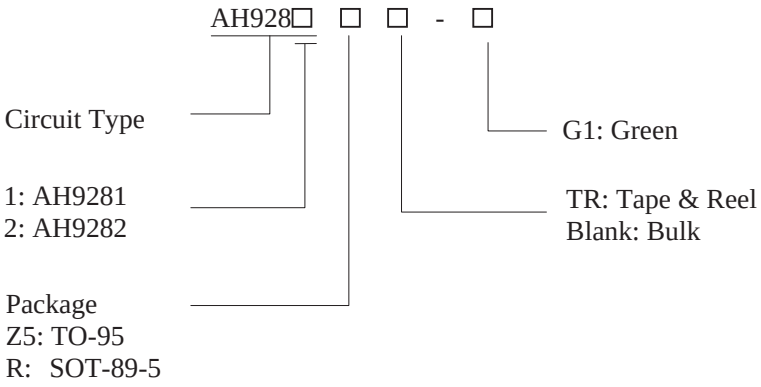
## Functional Block Diagram




A (B)
A for TO-95
B for SOT-89-5

Figure 3. Functional Block Diagram of AH9281/82

## Ordering Information




| Package | Temperature Range | Output Signal | Part Number | Marking ID | Packing Type |
|---|---|---|---|---|---|
| TO-95 | -40 to 125°C | FG | AH9281Z5-G1 | 9281Z5-G1 | Bulk |
| | | RD | AH9282Z5-G1 | 9282Z5-G1 | Bulk |
| SOT-89-5 | | FG | AH9281RTR-G1 | G41C | Tape & Reel |
| | | RD | AH9282RTR-G1 | G41D | Tape & Reel |

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

## Absolute Maximum Ratings (Note 1, $T_A$=25ºC)

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 18 | | V |
| Supply Current (Fault) | $I_{CC}$ | 6 | | mA |
| Peak Output Current | $I_{OUT\_P}$ | 1200 | | mA |
| Continuous Output Current | $I_{OUT\_C}$ | 600 | | mA |
| FG/RD Pull-up Voltage | $V_{FG}/V_{RD}$ | 28 | | V |
| Power Dissipation | $P_D$ | TO-95 | 600 | mV |
| | | SOT-89-5 | 800 | |
| Thermal Resistance (Junction to Ambient) | $\theta_{JA}$ | TO-95 | 208 | ºC/W |
| | | SOT-89-5 | 156 | |
| Storage Temperature | $T_{STG}$ | -55 to 150 | | ºC |
| ESD (Human Body Model) | ESD | 6000 | | V |
| ESD (Machine Model) | ESD | 400 | | V |

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

## Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 2.5 | 16 | V |
| Operating Ambient Temperature | $T_A$ | -40 | 125 | ºC |

## Electrical Characteristics

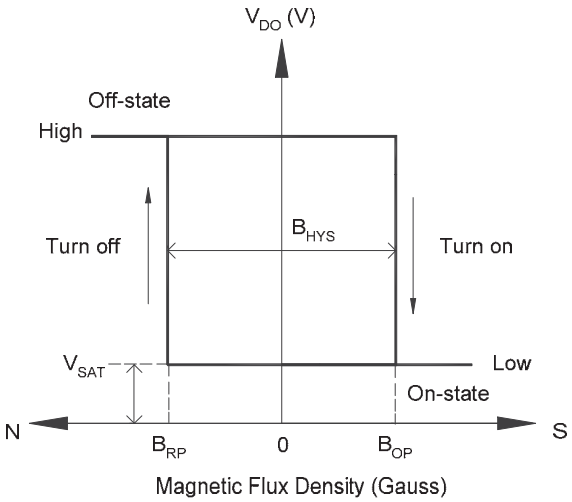
$V_{CC}$=12V, $T_A$=25°C, unless otherwise specified.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | Operating | 2.5 | 12 | 16 | V |
| Supply Current | $I_{CC}$ | Average | | 4 | 6 | mA |
| Output Current | $I_{OUT}$ | | | | 500 | mA |
| Output Leakage Current | $I_{LEAKAGE}$ | | | 0.1 | 10 | μA |
| Saturation Voltage | $V_{SAT}$ | $I_{OUT}$=350mA | | 600 | 1000 | mV |
| Output ON Time | $t_{ON}$ | | | 0.8 | | S |
| Output OFF Time | $t_{OFF}$ | | | 5 | | S |
| FG/RD Output Low Voltage | $V_{FGL}/V_{RDL}$ | $I_{FG}$=5mA | | 0.1 | 0.2 | V |
| FG/RD Output Leakage Current | $I_{FGLK}/I_{RDLK}$ | $V_{FG}/V_{RD}$=12V | | 0.1 | 10 | μA |
| FG/RD Output Current Limit | $I_{FGLIM}/ I_{RDLIM}$ | $V_{FG}/V_{RD}$=12V | | 30 | | mA |
| Output Zener Break-down Voltage | $V_Z$ | | | 35 | | V |

## Magnetic Characteristics

$V_{CC}$=12V, $T_A$=25°C, unless otherwise specified.

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Operating Point | $B_{OP}$ | 0 | 20 | 50 | Gauss |
| Releasing Point | $B_{RP}$ | -50 | -20 | 0 | Gauss |
| Hysteresis | $B_{HYS}$ | | 40 | | Gauss |



## Test Circuit

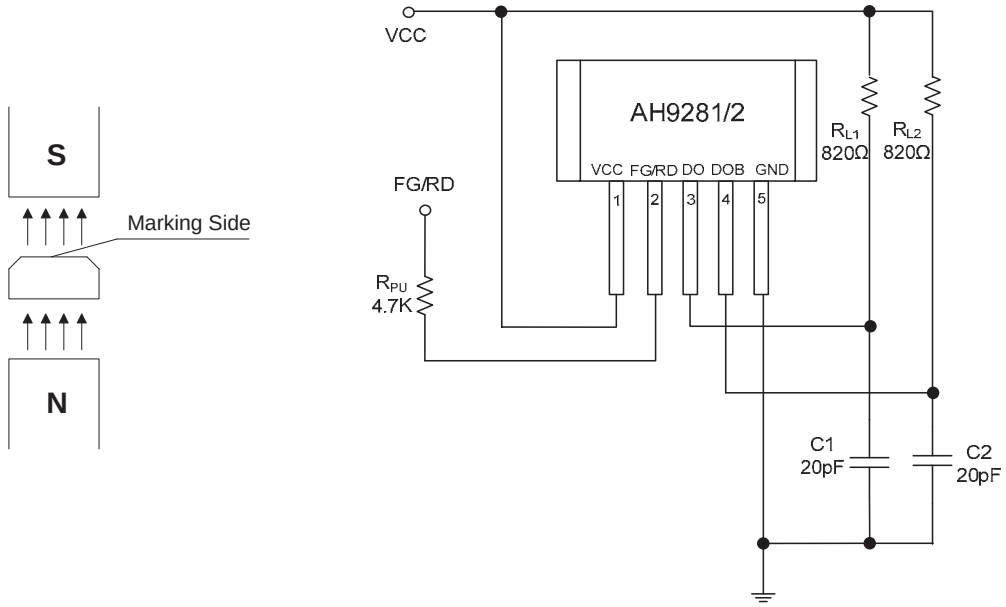



Figure 4. Basic Test Circuit of AH9281/82

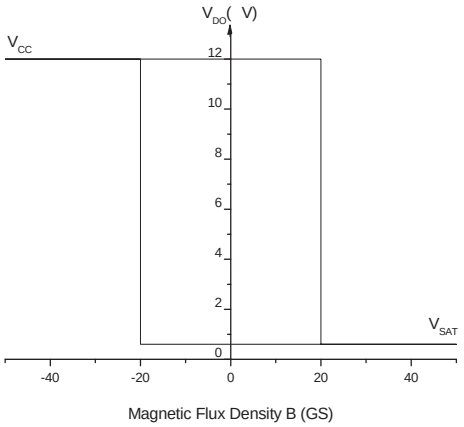



Figure 5. $V_{DO}$ vs. Magnetic Flux Density

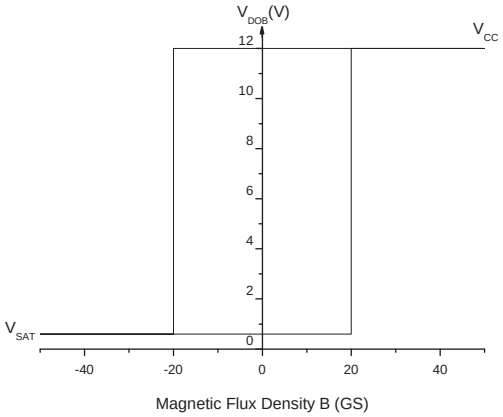



Figure 6. $V_{DOB}$ vs. Magnetic Flux Density

## Typical Performance Characteristics

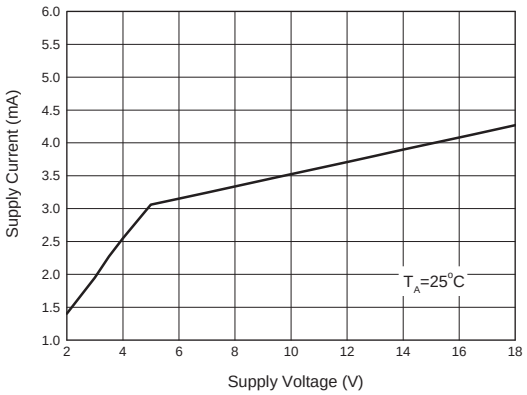



Figure 7. Supply Current vs. Supply Voltage

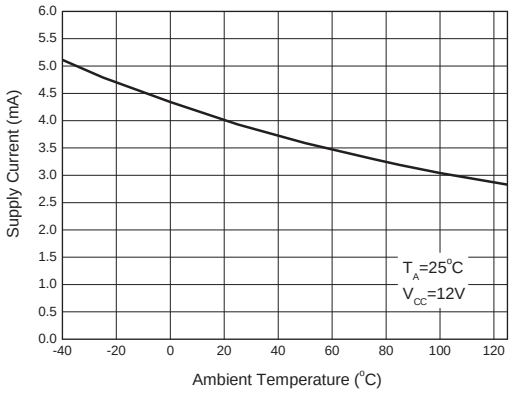



Figure 8. Supply Current vs. Ambient Temperature

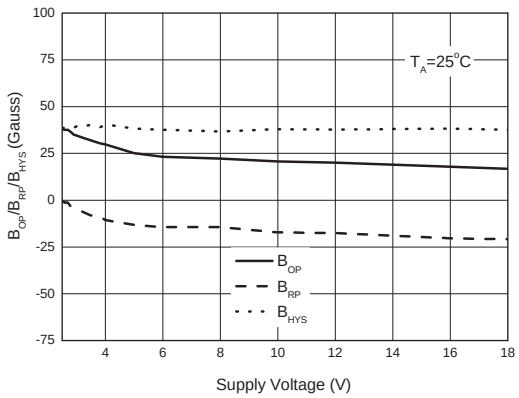



Figure 9. $B_{OP}/B_{RP}/B_{HYS}$ vs. Supply Voltage

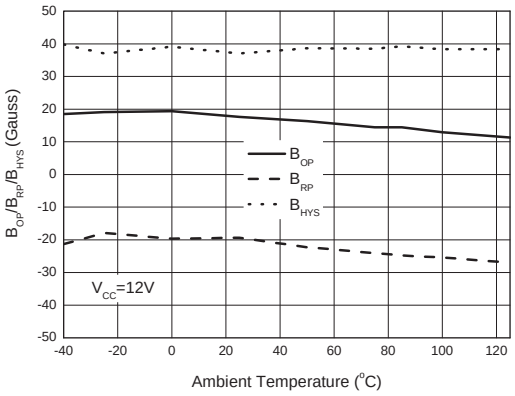



Figure 10. $B_{OP}/B_{RP}/B_{HYS}$ vs. Ambient Temperature

## Typical Performance Characteristics (Continued)

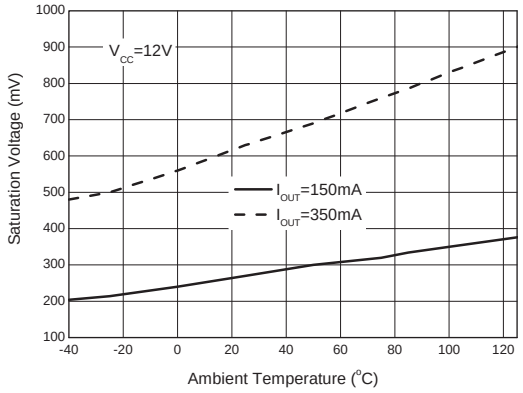



Figure 11. Saturation Voltage vs. Ambient Temperature

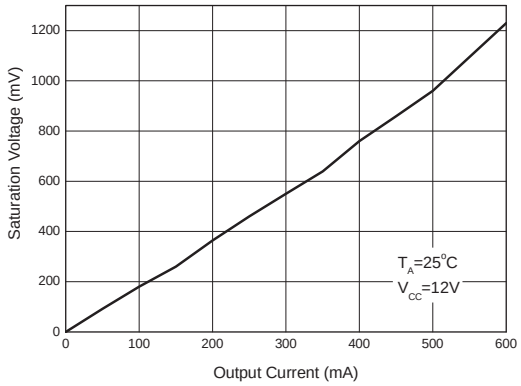



Figure 12. Saturation Voltage vs. Output Current

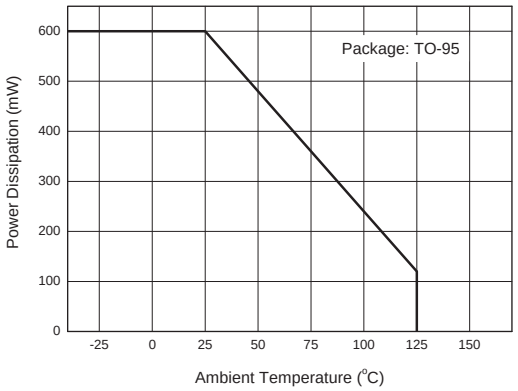



Figure 13. Power Dissipation vs. Ambient Temperature

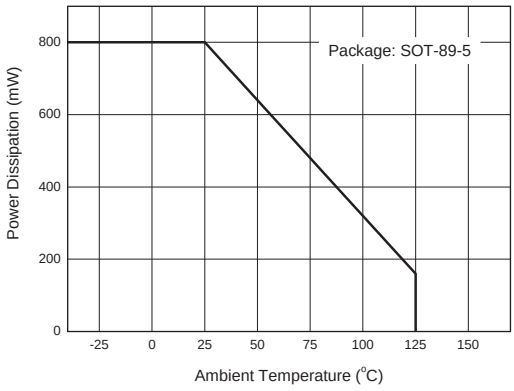



Figure 14. Power Dissipation vs. Ambient Temperature

## Typical Application

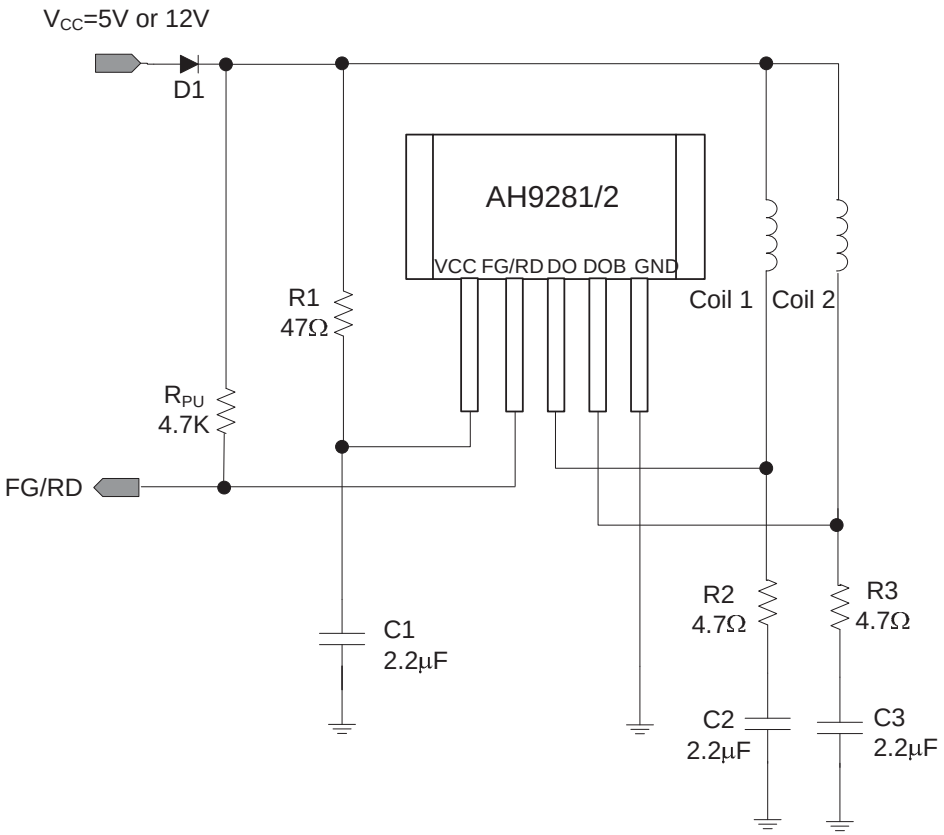



Figure 15. Typical Application 1 of AH9281/82 (TO-95, Note 2)

Note 2:
1. D1 is an ordinary diode used to filter the noise from VCC and protect IC if VCC and GND are plugged reversed.
2. R1=47Ω typical.
3. C1=C2=C3=2.2μF typical, electrolytic capacitors are better. They should be fine tuned based on system design.
4. R2=R3=4.7Ω typical. They can be cancelled according to system requirement.
5. $R_{PU}$=4.7kΩ typical.

## Typical Application (Continued)

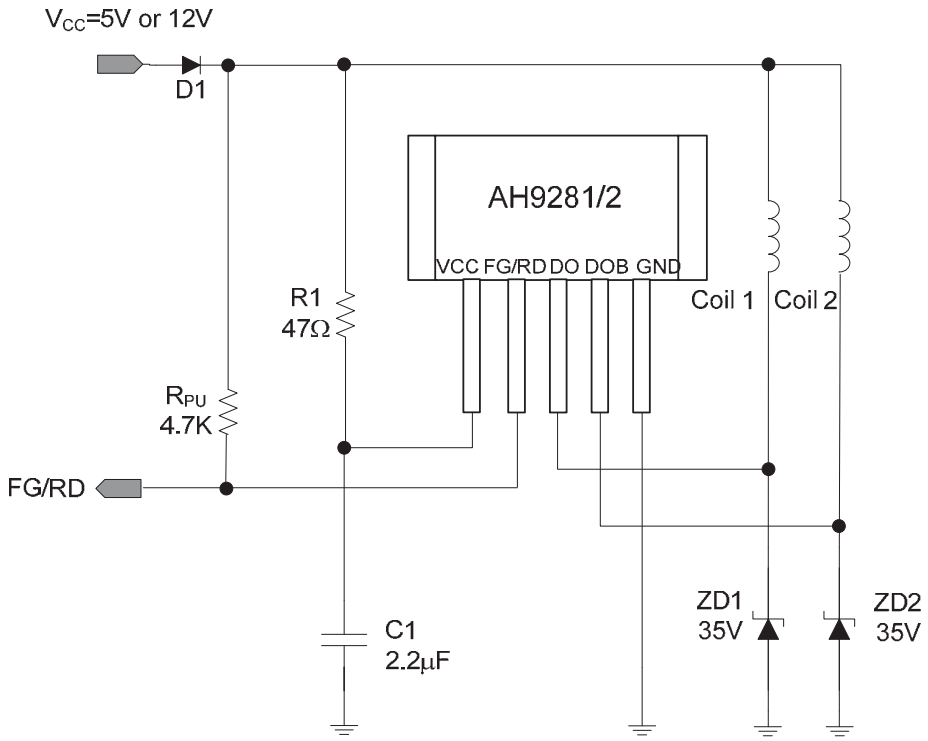



Figure 16. Typical Application 2 of AH9281/82 (TO-95, Note 3)

Note 3:
1. D1 is an ordinary diode used to filter the noise from VCC and protect IC if VCC and GND are plugged reversed.
2. R1=47Ω typical.
3. C1 =2.2μF typical, electrolytic capacitors are better. They should be fine tuned based on system design.
4. ZD1 and ZD2 breakdown voltage are 35V.
5. $R_{PU}$=4.7kΩ typical.

## Typical Application (Continued)

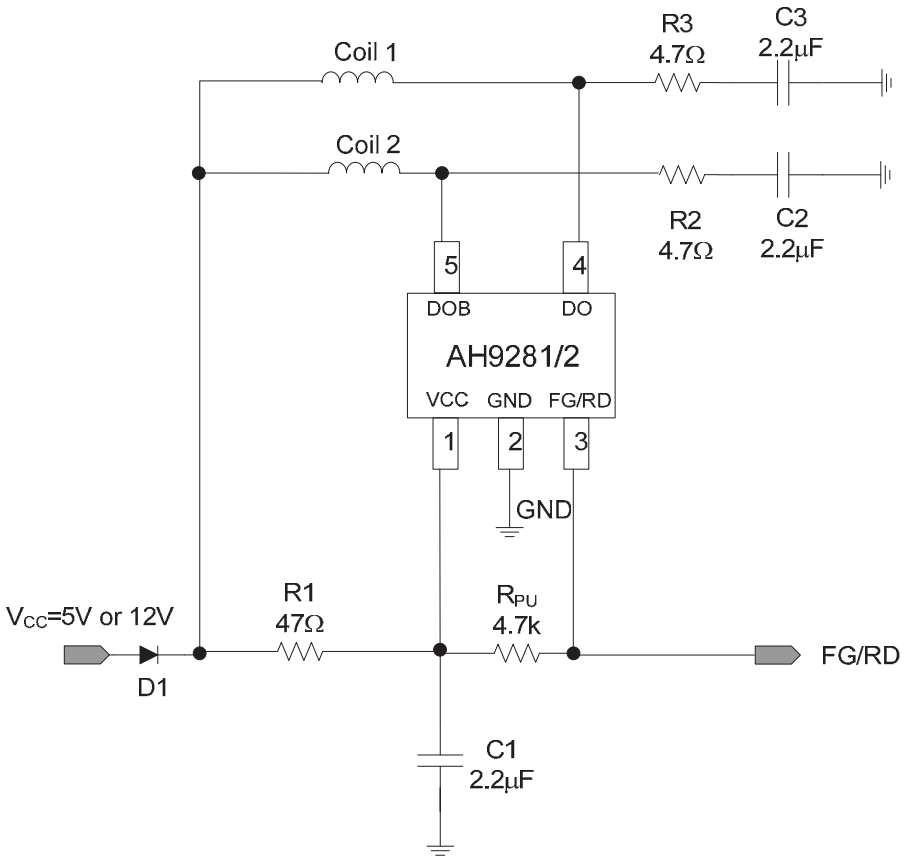



Figure 17. Typical Application 3 of AH9281/82 (SOT-89-5, Note 4)

Note 4:
1. D1 is an ordinary diode used to filter the noise from VCC and protect IC if VCC and GND are plugged reversed.
2. R1=47Ω typical.
3. C1=C2=C3=2.2μF typical, electrolytic capacitors are better. They should be fine tuned based on system design.
4. R2=R3=4.7Ω typical. They can be cancelled according to system requirement.
5. $R_{PU}$=4.7kΩ typical.

## Typical Application (Continued)

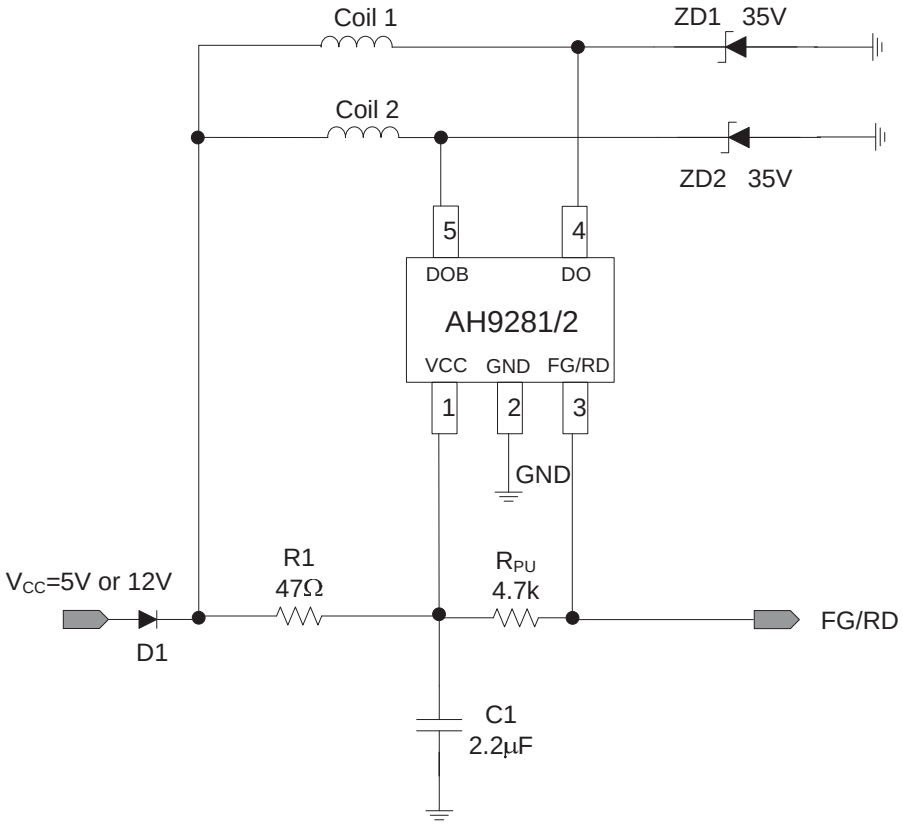



Figure 18. Typical Application 4 of AH9281/82 (SOT-89-5, Note 5)

Note 5:
1. D1 is an ordinary diode used to filter the noise from VCC and protect IC if VCC and GND are plugged reversed.
2. R1=47Ω typical.
3. C1=2.2μF typical, electrolytic capacitors are better. They should be fine tuned based on system design.
4. ZD1 and ZD2 breakdown voltage are 35V.
5. $R_{PU}$=4.7kΩ typical.
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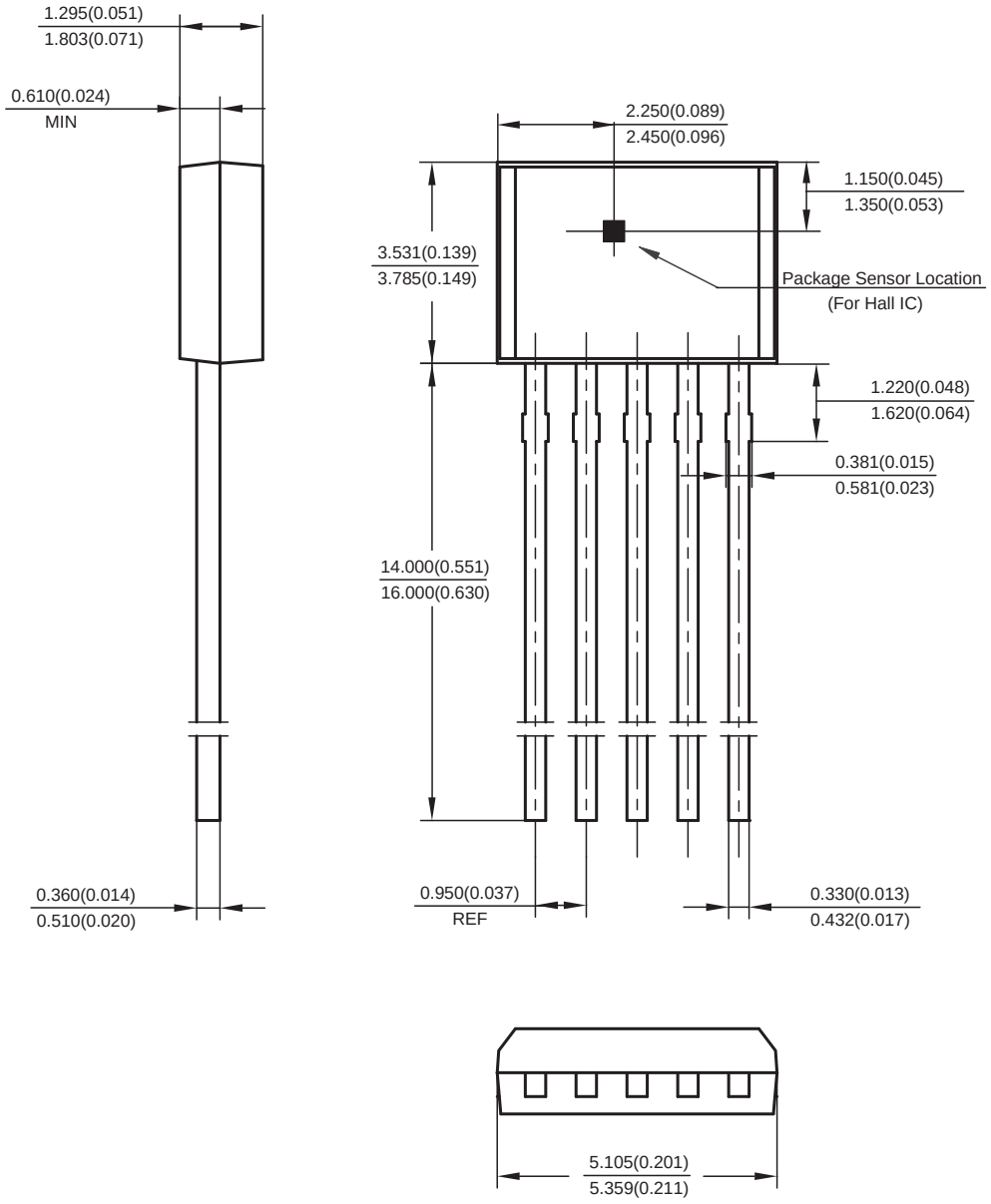
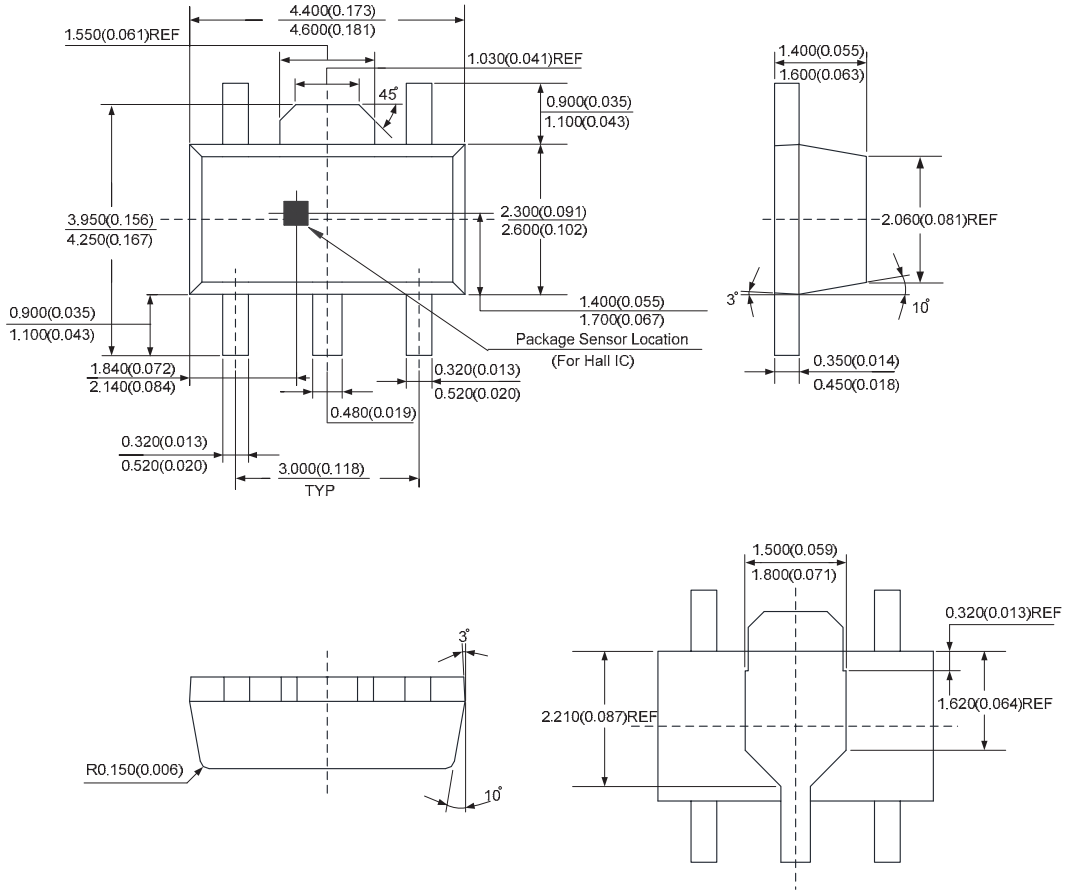
## Mechanical Dimensions

**TO-95** **Unit: mm(inch)**



## Mechanical Dimensions (Continued)

**SOT-89-5** **Unit: mm(inch)**



单击下面可查看定价，库存，交付和生命周期等信息

>>Diodes Incorporated(达迩科技（美台）)