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**COMPLEMENTARY OUTPUT HALL EFFECT LATCH****AH277A****General Description**

The AH277A is an integrated Hall sensor with output driver designed for electronic commutation of brushless DC motor applications. The device includes an on-chip Hall sensor for magnetic sensing, an amplifier that amplifies the Hall voltage, a Schmitt trigger to provide switching hysteresis for noise rejection, a temperature compensation circuit to compensate the temperature drift of Hall sensitivity and two complementary open-collector drivers for sinking large load current. It also includes an internal band-gap regulator which is used to provide bias voltage for internal circuits.

Placing the device in a variable magnetic field, if the magnetic flux density is larger than threshold  $B_{OP}$ , the pin DO will be turned low (on) and pin DOB will be turned high (off). This output state is held until the magnetic flux density reverses and falls below  $B_{RP}$ , then causes DO to be turned high (off) and DOB turned low (on).

AH277A is available in TO-94 (SIP-4L) package.

**Features**

- On-Chip Hall Sensor
- 3.5V to 16V Supply Voltage
- 400mA (avg) Output Sink Current
- Reversed Supply Voltage Protection
- -20°C to 85°C Operating Temperature
- Low Profile TO-94 (SIP-4L) Package
- ESD Rating: 300V (Machine Model)

**Applications**

- Dual-Coil Brushless DC Motor
- Dual-Coil Brushless DC Fan
- Revolution Counting
- Speed Measurement

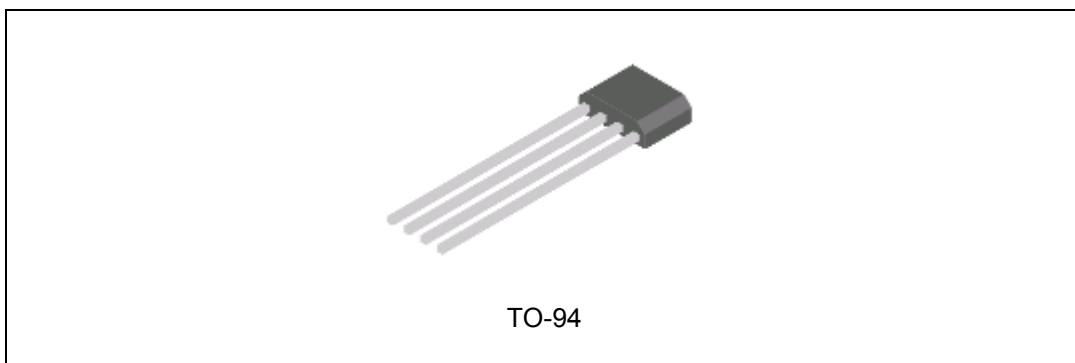


Figure 1. Package Type of AH277A

**COMPLEMENTARY OUTPUT HALL EFFECT LATCH** **AH277A**

**Pin Configuration**

Z4 Package  
(TO-94)

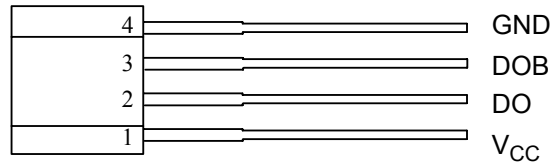


Figure 2. Pin Configuration of AH277A (Front View)

**Pin Description**

| Pin Number | Pin Name        | Function       |
|------------|-----------------|----------------|
| 1          | V <sub>CC</sub> | Supply voltage |
| 2          | DO              | Output 1       |
| 3          | DOB             | Output 2       |
| 4          | GND             | Ground         |

**COMPLEMENTARY OUTPUT HALL EFFECT LATCH**

**AH277A**

**Functional Block Diagram**

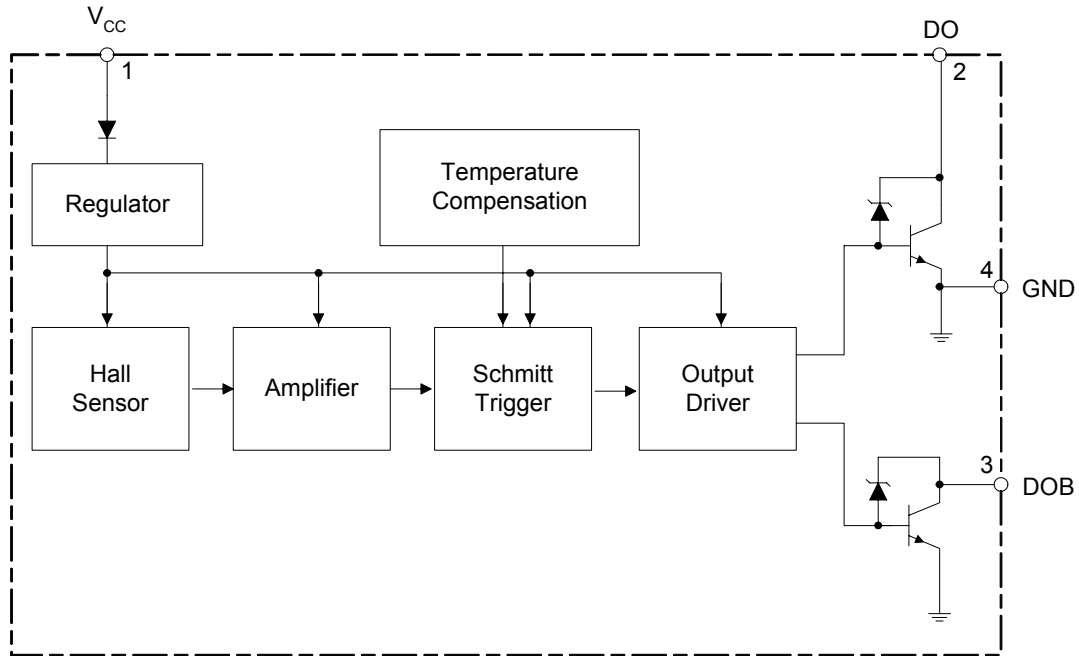
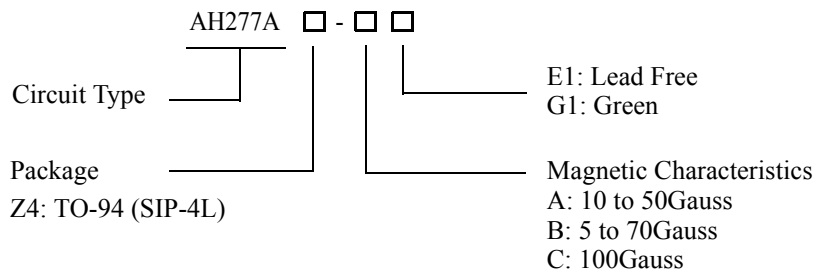


Figure 3. Functional Block Diagram of AH277A

**Ordering Information**



| Package | Temperature Range | Part Number  |              | Marking ID |           | Packing Type |
|---------|-------------------|--------------|--------------|------------|-----------|--------------|
|         |                   | Lead Free    | Green        | Lead Free  | Green     |              |
| TO-94   | -20 to 85°C       | AH277AZ4-AE1 | AH277AZ4-AG1 | AH277A     | AH277A-G1 | Bulk         |
|         |                   | AH277AZ4-BE1 | AH277AZ4-BG1 | AH277A     | AH277A-G1 | Bulk         |
|         |                   | AH277AZ4-CE1 | AH277AZ4-CG1 | AH277A     | AH277A-G1 | Bulk         |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green package.

**COMPLEMENTARY OUTPUT HALL EFFECT LATCH****AH277A****Absolute Maximum Ratings (Note 1)** $(T_A=25^{\circ}\text{C})$ 

| Parameter                  | Symbol              | Value         | Unit                               |
|----------------------------|---------------------|---------------|------------------------------------|
| Supply Voltage             | $V_{CC}$            | 20            | V                                  |
| Reverse Protection Voltage | $V_{RCC}$           | -20           | V                                  |
| Magnetic Flux Density      | B                   | Unlimited     | Gauss                              |
| Output Current             | Continuous          | 400           | mA                                 |
|                            | Hold                | 600           | mA                                 |
|                            | Peak (start up)     | 800           | mA                                 |
| Power Dissipation          | $P_D$               | 550           | mW                                 |
| Thermal Resistance         | Die to atmosphere   | $\theta_{JA}$ | 227<br>$^{\circ}\text{C}/\text{W}$ |
|                            | Die to package case | $\theta_{JC}$ | 49<br>$^{\circ}\text{C}/\text{W}$  |
| Storage Temperature        | $T_{STG}$           | -50 to 150    | $^{\circ}\text{C}$                 |
| ESD (Machine Model)        |                     | 300           | V                                  |
| ESD (Human Body Model)     |                     | 2000          | 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. "Absolute Maximum Ratings" for extended period may affect device reliability.

**Recommended Operating Conditions** $(T_A=25^{\circ}\text{C})$ 

| Parameter           | Symbol   | Min | Max | Unit               |
|---------------------|----------|-----|-----|--------------------|
| Supply Voltage      | $V_{CC}$ | 3.5 | 16  | V                  |
| Ambient Temperature | $T_A$    | -20 | 85  | $^{\circ}\text{C}$ |



**COMPLEMENTARY OUTPUT HALL EFFECT LATCH** **AH277A**

**Electrical Characteristics**

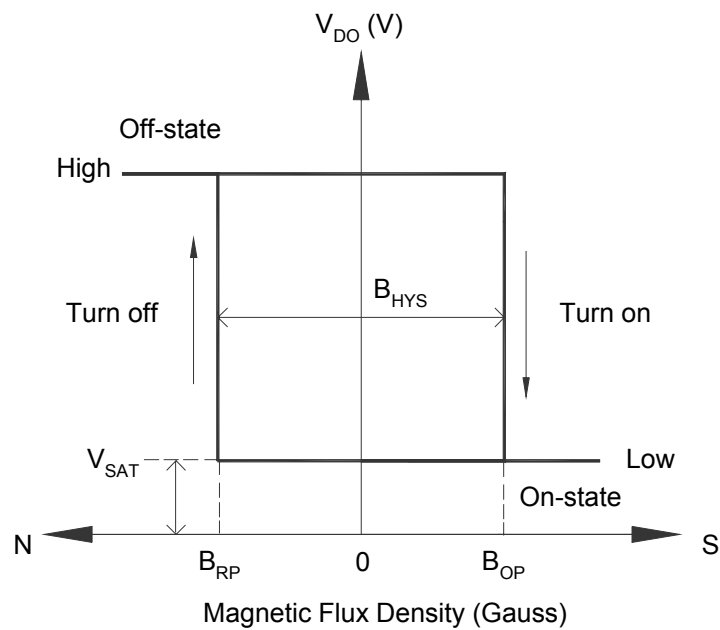
( $T_A=25^{\circ}C$ ,  $V_{CC}=14V$ , unless otherwise specified)

| Parameter                      | Symbol     | Test Condition             | Min | Typ  | Max | Unit    |
|--------------------------------|------------|----------------------------|-----|------|-----|---------|
| Output Saturation Voltage      | $V_{SAT}$  | $V_{CC}=3.5V, I_O=100mA$   |     | 0.4  |     | V       |
|                                |            | $I_O=400mA$                |     | 0.35 | 0.6 | V       |
| Output Leakage Current         | $I_{OL}$   | $V_{CE}=16V$               |     | 0.1  | 10  | $\mu A$ |
| Supply Current                 | $I_{CC}$   | $V_{CC}=16V$ , Output Open |     | 12   | 16  | mA      |
| Output Rise Time               | $t_r$      | $R_L=820\Omega, C_L=20pF$  |     | 3.0  | 10  | $\mu s$ |
| Output Fall Time               | $t_f$      | $R_L=820\Omega, C_L=20pF$  |     | 0.3  | 1.5 | $\mu s$ |
| Switch Time Differential       | $\Delta t$ | $R_L=820\Omega, C_L=20pF$  |     | 3.0  | 10  | $\mu s$ |
| Output Zener Breakdown Voltage | $V_Z$      |                            |     | 55   |     | V       |

**Magnetic Characteristics**

( $T_A=25^{\circ}C$ )

| Parameter       | Symbol    | Grade | Min  | Typ | Max | Unit  |
|-----------------|-----------|-------|------|-----|-----|-------|
| Operating Point | $B_{OP}$  | A     | 10   | 30  | 50  | Gauss |
|                 |           | B     | 5    |     | 70  | Gauss |
|                 |           | C     |      |     | 100 | Gauss |
| Releasing Point | $B_{RP}$  | A     | -50  | -30 | -10 | Gauss |
|                 |           | B     | -70  |     | -5  | Gauss |
|                 |           | C     | -100 |     |     | Gauss |
| Hysteresis      | $B_{HYS}$ |       |      | 60  |     | Gauss |



**Magnetic Characteristics (Continued)**

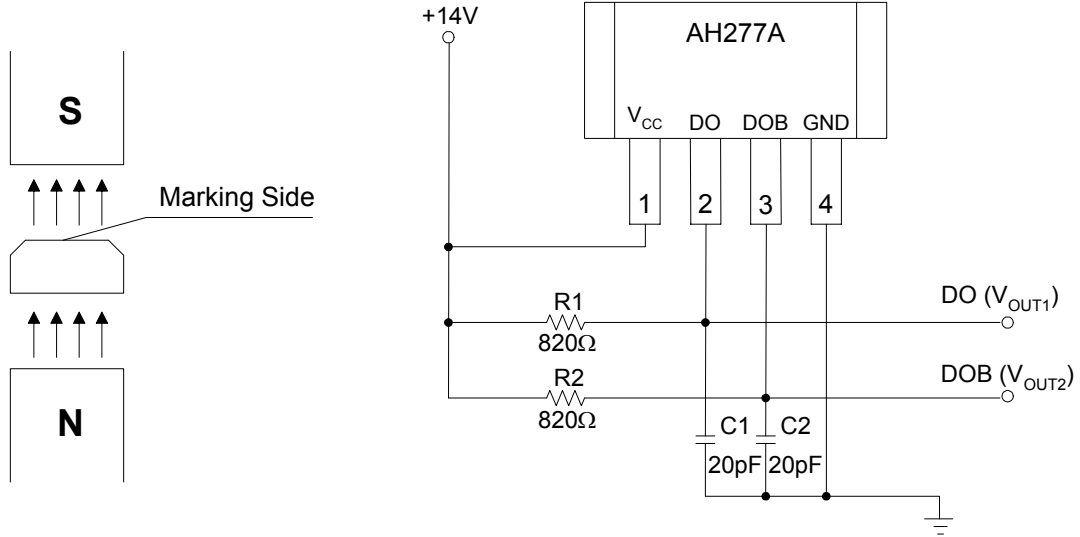


Figure 4. Basic Test Circuit

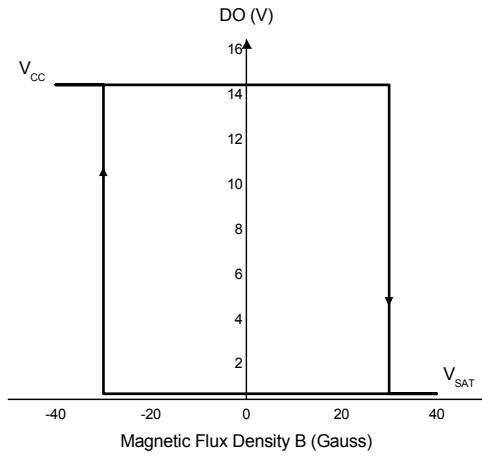


Figure 5.  $V_{DO}$  vs. Magnetic Flux Density

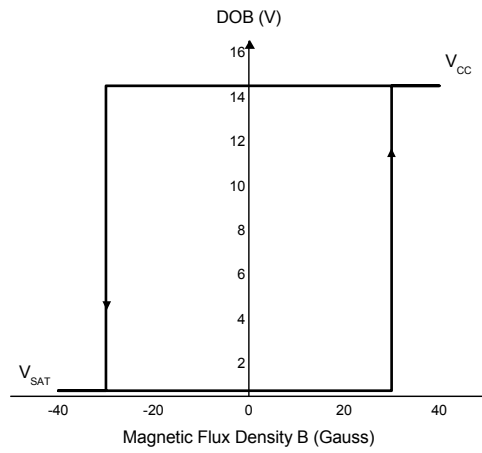


Figure 6.  $V_{DOB}$  vs. Magnetic Flux Density



**COMPLEMENTARY OUTPUT HALL EFFECT LATCH**

**AH277A**

**Typical Performance Characteristics**

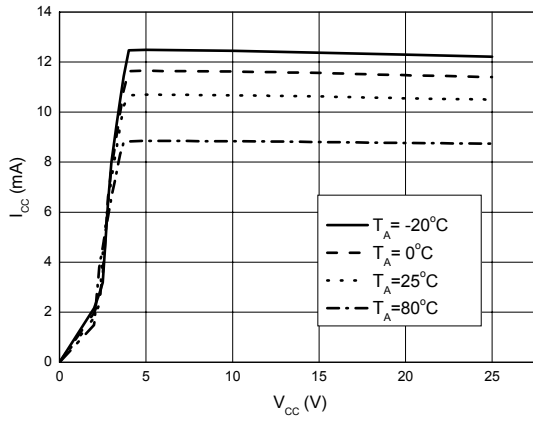


Figure 7. I<sub>CC</sub> vs. V<sub>CC</sub>

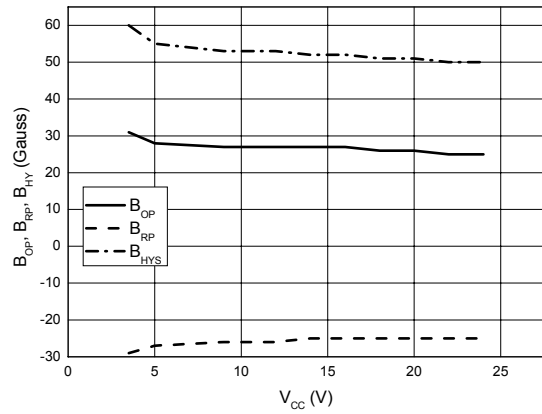


Figure 8. B<sub>OP</sub>/B<sub>RP</sub>/B<sub>HYS</sub> vs. V<sub>CC</sub>

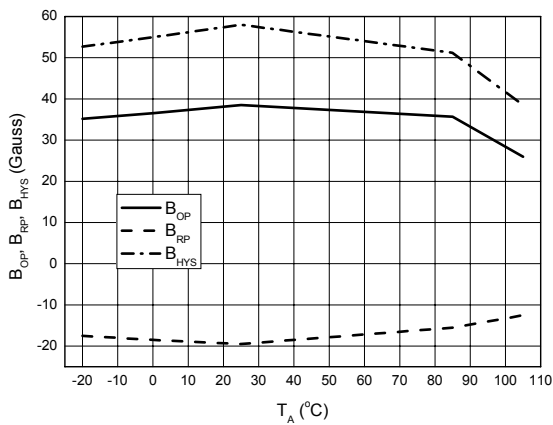


Figure 9. B<sub>OP</sub>/B<sub>RP</sub>/B<sub>HYS</sub> vs. Ambient Temperature

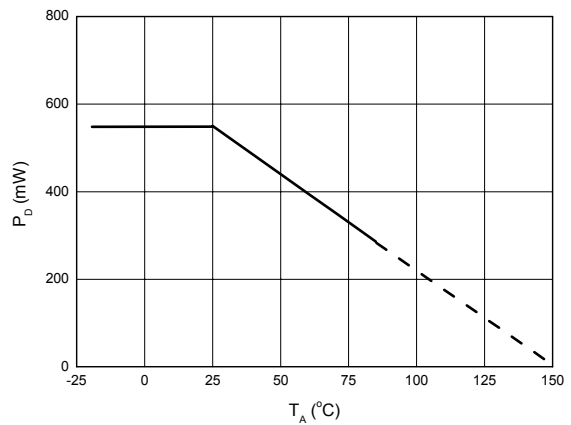


Figure 10. P<sub>D</sub> vs. Ambient Temperature



**COMPLEMENTARY OUTPUT HALL EFFECT LATCH**

**AH277A**

**Typical Performance Characteristics (Continued)**

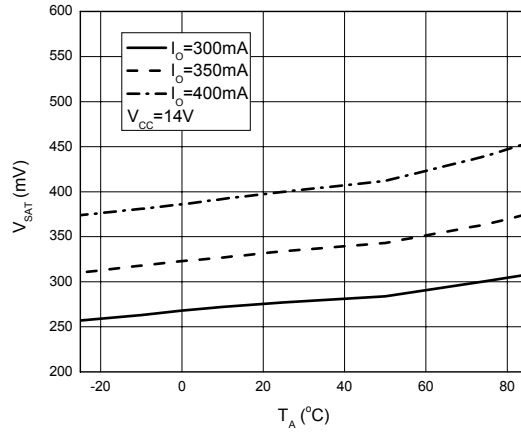
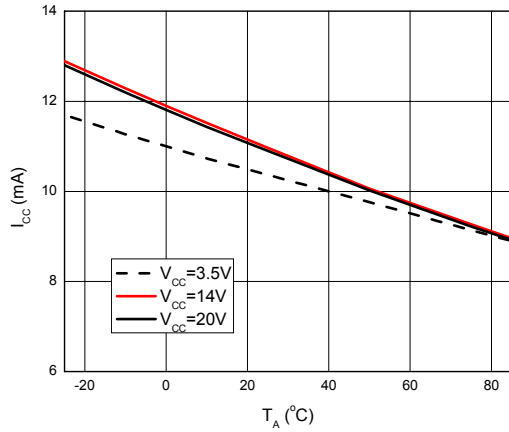


Figure 11. Supply Current vs. Ambient Temperature      Figure 12. Saturation Voltage vs. Ambient Temperature

**Typical Applications**

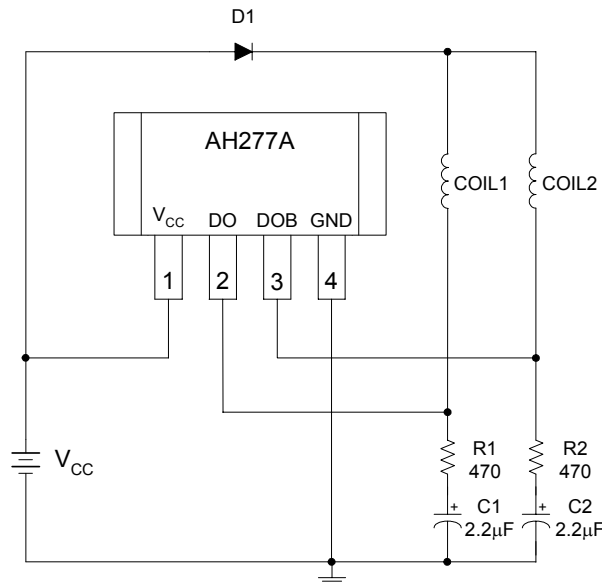


Figure 13. Typical Application Circuit with D1(Note 2)

Note 2: AH277A has Reversed Supply Voltage Protection. For DC fan application, sometimes need to test power reverse connection condition. The internal diode only protects chip-side but not for coil-side. It is recommended to add one external diode D1 in application to block the reverse current from coil-side as shown in Figure 13.



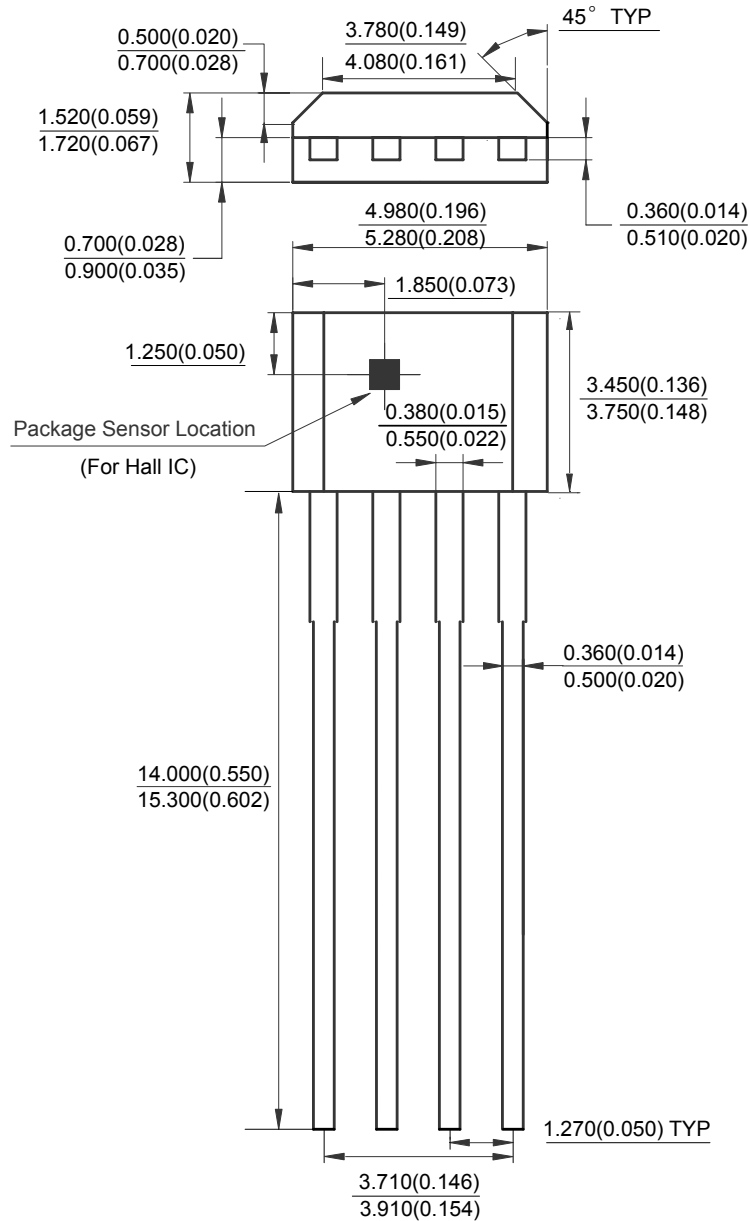
**COMPLEMENTARY OUTPUT HALL EFFECT LATCH**

**AH277A**

**Mechanical Dimensions**

**TO-94**

**Unit: mm(inch)**





## BCD Semiconductor Manufacturing Limited

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