

4.5-24V V_{DD} Hall Effect Sensor

1. Description

The ES44EUA is small, versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet.

These unipolar sensors are designed to meet the requirements of a wide range of potential applications. These economical unipolar sensors are well suited for simple, high-volume, cost-sensitive position and motion sensing applications.

The 4.5Vdc to 24Vdc supply voltage range allows this device to be used in very wide voltage applications.

2. Features

- Wide operating voltage range: 4.5V to 24V
- Built-in reverse voltage protecting capability
- RoHS-compliant material meets directive 2011/65/EU
- Robust design: will operate up to 85°C
- Package: T0-92S package
- Unipolar respond to a single pole: North (AT) or South (A,BT and ET), making these products well-suited for shift selectors, wiper end/home position, door ajar/open, and vane-interrupt systems etc.

3. Applications

- Speed and RPM sensing
- Door or lid closure detection
- Flow-rate sensing
- Printer head position sensing
- Robotics control
- Medication bin monitor on portable drug carts

4. Package Information

| Part Number | Marking | Description |
|-------------|---------|---|
| ES44EUA | 44E | Flat, TO-92S package, bulk packing (1000 units per bag) |

Table-1 Package Information

5. Pin Configuration and Functions

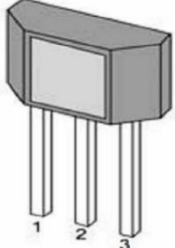
| Name | Number | Description | Outline |
|------|--------|----------------------|---|
| VDD | 1 | Supply Voltage pin |  |
| GND | 2 | Ground pin | |
| OUT | 3 | Collector Output pin | |

Table-2 Pin configuration

6. Specification

6.1 Absolute Maximum rating

Over operating free-air temperature range (unless otherwise noted)

| Parameter | Symbol | Min | Max | Units |
|-------------------------------|-----------|----------|-----|-------|
| Supply Voltage | V_{DD} | | 24 | V |
| VDD Reverse Voltage V_{DD} | V_{RDD} | | -24 | V |
| Output Voltage | V_{OUT} | | 24 | V |
| Output Current | I_{OUT} | | 50 | mA |
| Operating Ambient Temperature | T_A | -40 | 85 | °C |
| Storage Temperature | T_S | -65 | 170 | °C |
| Magnetic Flux | B | No Limit | | Gauss |

Table-3 Absolute Maximum rating

6.2 ESD Protection

| Parameter | Value | Unit |
|--|---------|------|
| HBM (human body mode, C=100pF, R=1.5 kohm) | +/-4000 | V |

Table-4 ESD Protection

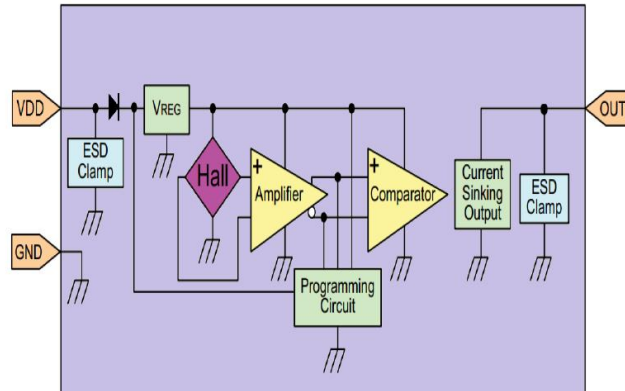
6.3 Electric Characteristics

(At 4.5V to 24V supply, 20mA load, TA= -40°C to 85°C)

| Symbol | Parameter | Test Condition | Min | Typ | Max | Units |
|-------------------|----------------------------|---|-----|-----|-----|-------|
| V _{DD} | Supply voltage | -40°C to 85°C | 4.5 | | 24 | V |
| I _{DD} | Supply Current | V _{DD} = 12V | | 4.0 | 10 | mA |
| V _{DSon} | Output saturation voltage | at 20mA, Gauss >Bop | | | 0.4 | V |
| I _{OFF} | Output Leakage Current | B < B _{rp} | | | 10 | uA |
| T _R | Output rise time | V _{DD} = 12V at 25°C C _L = 20pF | | | 1.5 | us |
| T _F | Output fall time | V _{DD} = 12V at 25°C C _L = 20pF | | | 1.5 | us |
| B _{OP} | Magnetic operating point | TA = 25°C | 70 | | 240 | Gauss |
| B _{RP} | Magnetic release point | TA = 25°C | 50 | | 220 | Gauss |
| B _{HYST} | Magnetic hysteresis window | TA = 25°C B _{OP} - B _{RP} | 30 | 55 | 80 | Gauss |
| T | Operating temperature | | -40 | | 85 | °C |
| T _s | Storage temperature: | | -65 | | 170 | °C |

Table-5 Electric Characteristics

7. Typical Application

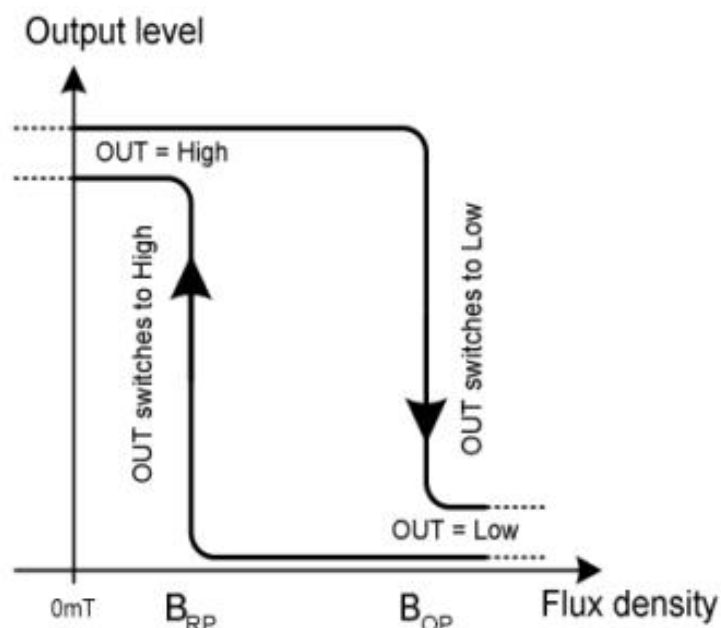


8. Function Description

The ES44EUA exhibits unipolar magnetic switching characteristics. Therefore, it requires south or north poles to operate properly.

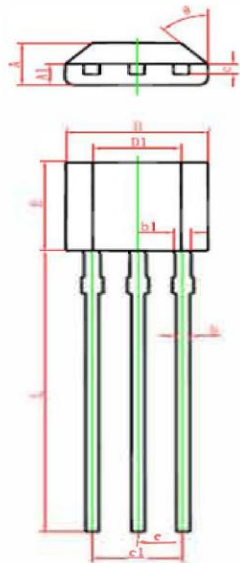
The device behaves as a unipolar with asymmetric operating and release switching points. This means While the magnetic flux density(B) is larger than operate point (Bop), the output will be turned on (Low), while the magnetic flux density(B) is lower than release point (Brp), then turn off (High).

9. Magnetic Activation



Unipolar switch characteristic

10. Dimension (TO-92S)



Dimension; mm

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 1.420 | 1.620 | 0.056 | 0.064 |
| A1 | 0.660 | 0.860 | 0.026 | 0.034 |
| b | 0.350 | 0.480 | 0.014 | 0.019 |
| b1 | 0.400 | 0.550 | 0.016 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| D | 3.900 | 4.100 | 0.154 | 0.161 |
| D1 | 2.280 | 2.680 | 0.090 | 0.106 |
| E | 3.050 | 3.250 | 0.120 | 0.128 |
| e | 1.270 TYP. | | 0.050 TYP. | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 15.100 | 15.500 | 0.594 | 0.610 |
| θ | 45° TYP. | | 45° TYP | |

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