ADV001 Latching Bipolar Digital Switches

Features:
- Latching bipolar operation (south field ON, north field OFF)
- Extremely low operate points for high sensitivity and wide airgaps
- Digital switch output
- MSOP8 and TDFN6 packages

Description:
The ADV001 is a GMR Digital Switch™ product using a unique bipolar output GMR material. This material allows a sensor with a negative (south pole) operate point and a positive (north pole) release point.

The sensor can provide two travel limits with a single sensor, or be used with alternating north / south pole magnetic encoders.

The sensor is extremely sensitive with typical operate/release points of ±4 oersteds. Operate points are also extremely stable over a temperature range of −40°C to +125°C. The high sensitivity and excellent temperature stability give the ADV001 better airgap performance and switching precision than other products. The output is on/off current-sinking. The IC is available in an MSOP8 (part number ADV001-00E) or 2.5 mm x 2.5 mm TDFN6 package (part number ADV001-10E).

The following specifications are valid over all operating voltage and temperature ranges:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Operate Point$^1$</td>
<td>−10</td>
<td>−4</td>
<td>0</td>
<td>Oersteds</td>
</tr>
<tr>
<td>Magnetic Release Point$^1$</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>Oersteds</td>
</tr>
<tr>
<td>Operate/Release Differential</td>
<td>2</td>
<td></td>
<td>12</td>
<td>Oersteds</td>
</tr>
<tr>
<td>Off-Axis Field</td>
<td></td>
<td></td>
<td>250</td>
<td>Oersteds</td>
</tr>
<tr>
<td>Operating Supply Voltage (VCC)</td>
<td>4.5</td>
<td></td>
<td>30</td>
<td>Volts</td>
</tr>
<tr>
<td>Quiescent Supply Current (VCC = 12 V)</td>
<td>2.5</td>
<td></td>
<td>4.5</td>
<td>mA</td>
</tr>
<tr>
<td>Output Drive Current</td>
<td>0</td>
<td></td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>$V_{OL}$ (VCC ≥ 5 V; 20 mA output sink current$^2$)</td>
<td></td>
<td>0.4</td>
<td></td>
<td>Volts</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>100</td>
<td></td>
<td></td>
<td>KHz</td>
</tr>
<tr>
<td>Temperature Range of Operation</td>
<td>−40</td>
<td></td>
<td>125</td>
<td>°C</td>
</tr>
</tbody>
</table>

Notes:
1. $V_{OL}$ at VCC = 4.5 V may exceed 0.4 V.
2. 1 Oe (Oersted) = 1 Gauss in air = 0.1 mT.
Functional Block Diagram and Pinout

Operation
The magnetic field should be applied in the plane of the IC package in the direction of sensitivity (the cross-axis direction). The output is open collector, so an external pull-up resistor is required. The output is configured for pull-down when “ON.”

The charts below show the response of the ADV001 bipolar sensor compared to typical sensors, which are “omnipolar”:

Figure 1a: Typical magnetic switch.
Figure 1b: ADV001 bipolar magnetic sensor.
The following figures illustrate the sensor’s operation:

A south magnetic field on the pin 8 side of the part (or a north field on the pin 1 side) turns the sensor on (Figure 2b). The output remains latched on (Figure 2c) until an opposite field is applied (Figure 2d).

**Typical Applications**

**Ring-magnet encoder**
As illustrated in Fig. 3a, ADV001 sensors are ideal to detect the alternating north and south poles of a ring-magnet. Because of their extraordinary sensitivity, the sensors can be position a large distance from the ring magnet.

**Linear actuator with two travel limits**
ADV001 sensors can provide two travel limits with a single sensor, by positioning a north magnet pole at one limit, and a south pole at the other as illustrated below. The sensor output toggles at each limit, and can be used to set the direction of a reciprocating linear actuator as shown in Fig. 3b.
Package Drawings and Specifications

**MSOP8 (ADV001-00E)**

Notes:
1. The MSOP8 package has thermal power dissipation of 320°C/Watt in free air.
2. Thermal performance is improved when the package is soldered to a circuit board.

**2.5 mm x 2.5 mm TDFN6 (ADV001-10E)**

Notes:
1. The TDFN6 package has thermal power dissipation of 320°C/Watt in free air.
2. Thermal performance is improved when the package is soldered to a circuit board.
<table>
<thead>
<tr>
<th>Pinout</th>
<th>Package</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MSOP8 (ADV001-00E)</td>
<td>TDFN6 (ADV001-10E)</td>
<td></td>
</tr>
<tr>
<td>Vcc</td>
<td>Pin 1</td>
<td>Pin 1</td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>Pin 5</td>
<td>Pin 4</td>
<td></td>
</tr>
<tr>
<td>Out</td>
<td>Pin 8</td>
<td>Pin 6</td>
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