Dual Channel Hall Effect Switch CYD8526
With Speed and Direction Outputs

The CYD8526 is a dual-channel Hall-effect sensor IC ideal for use in speed and direction sensing applications incorporating encode ring-magnet targets. The Hall elements are both photo lithographically aligned to better than 1um. Maintaining accurate displacement between the two active Hall elements eliminates the major manufacturing hurdle encountered in fine-pitch detection applications. The CYD8526 is a sensitive, temperature-stable magnetic device suitable for use in harsh automotive and industrial environments.

The Hall elements of the sensor CYD8526 are spaced 1.4mm apart, which provides excellent speed and direction information for small-geometric targets. Extremely low-drift amplifiers guarantee symmetry between the switches to maintain signal quadrature. An on-chip regulator allows the use of this device over a wide operating voltage range of 3.5V to 24V.

The CYD8526 is available in a 4-pin SIP package and a plastic SOT89B package. The packages are lead (Pb) free, with 100% matte tin leadframe plating.

Features
- Two matched Hall switches on a substrate
- Dual channel outputs for speed and direction
- Good temperature stability
- High sensitivity (B_{OP} and B_{RP})
- 3.5V to 24V supply voltage
- Solid-state reliability
- Small package sizes
- RoHS compliant

Applications
- Anti-pinch electric motor control
- Motor and fan control
- Magnetic encoder
- Rotating shaft monitoring
- Auto-motive transmission position
- Garage door openers
- Power sliding doors
- Sunroofs motors

Device information

<table>
<thead>
<tr>
<th>Part number</th>
<th>Packing</th>
<th>Mounting</th>
<th>Temperature</th>
<th>B_{OP} (typ.)</th>
<th>BRP (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYD8526VB</td>
<td>Bulk, 1000pcs/bag</td>
<td>4-pin SIP</td>
<td>-40°C~150°C</td>
<td>+10.0mT</td>
<td>-10.0mT</td>
</tr>
</tbody>
</table>
Electrical Specifications

Over operating free-air temperature range ($V_{DD} = 5.0\text{V}$, unless otherwise specified)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DD}$</td>
<td>Operating supply voltage</td>
<td>$T_J &lt; T_J\ (\text{max})$</td>
<td>3.50</td>
<td>--</td>
<td>24</td>
<td>V</td>
</tr>
<tr>
<td>$I_{DD}$</td>
<td>Operating supply current</td>
<td>$V_{DD}=3.5$ to $24\text{V}$</td>
<td>2.0</td>
<td>4.0</td>
<td>6.5</td>
<td>mA</td>
</tr>
<tr>
<td>$t_{on}$</td>
<td>Power on time</td>
<td></td>
<td>--</td>
<td>35</td>
<td>50</td>
<td>$\mu\text{s}$</td>
</tr>
<tr>
<td>$I_{OL}$</td>
<td>Off-state leakage current</td>
<td>Output Hi-Z</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>$\mu\text{A}$</td>
</tr>
<tr>
<td>$R_{DS(on)}$</td>
<td>FET on resistance</td>
<td>$V_{DD}=5\text{V}$, $I_o=10\text{mA}$, $T_A=25\degree\text{C}$</td>
<td>--</td>
<td>20</td>
<td>--</td>
<td>$\Omega$</td>
</tr>
<tr>
<td>$t_{d}$</td>
<td>Output delay time</td>
<td>$B=B_{RP}$ to $B_{OP}$</td>
<td>--</td>
<td>13</td>
<td>25</td>
<td>$\mu\text{s}$</td>
</tr>
<tr>
<td>$t_{r}$</td>
<td>Output rise time</td>
<td>$R_1=1\text{k}\Omega$, $C_0=50\text{pF}$</td>
<td>--</td>
<td>--</td>
<td>0.5</td>
<td>$\mu\text{s}$</td>
</tr>
<tr>
<td>$t_{f}$</td>
<td>Output fall time</td>
<td>$R_1=1\text{k}\Omega$, $C_0=50\text{pF}$</td>
<td>--</td>
<td>--</td>
<td>0.2</td>
<td>$\mu\text{s}$</td>
</tr>
<tr>
<td>$f_{BW}$</td>
<td>Bandwidth</td>
<td></td>
<td>40</td>
<td>--</td>
<td>--</td>
<td>kHz</td>
</tr>
</tbody>
</table>

Magnetic Specifications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$B_{OP}$</td>
<td>Operating point</td>
<td>$VB\ Package$</td>
<td>7.0</td>
<td>10.0</td>
<td>13.0</td>
<td>mT</td>
</tr>
<tr>
<td>$B_{RP}$</td>
<td>Release point</td>
<td>$VB\ Package$</td>
<td>-13.0</td>
<td>-10.0</td>
<td>-7.0</td>
<td>mT</td>
</tr>
<tr>
<td>$B_{HYS}$</td>
<td>Hysteresis</td>
<td></td>
<td>--</td>
<td>20</td>
<td>--</td>
<td>mT</td>
</tr>
<tr>
<td>$B_0$</td>
<td>Magnetic Offset</td>
<td>$B_0=(B_{OP}+B_{RP})/2$</td>
<td>--</td>
<td>0</td>
<td>--</td>
<td>mT</td>
</tr>
</tbody>
</table>

$1\text{mT} = 10\text{Gs}$

Absolute Maximum Ratings

Over operating free-air temperature range

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V_{DD}$</td>
<td>-0.5</td>
<td>35</td>
<td>V</td>
</tr>
<tr>
<td>Output voltage</td>
<td>$V_{OUT}$</td>
<td>-0.5</td>
<td>35</td>
<td>V</td>
</tr>
<tr>
<td>Output Sink Current, $I_{OUT}$</td>
<td>$I_{SINK}$</td>
<td>0</td>
<td>30</td>
<td>mA</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>$T_A$</td>
<td>-40</td>
<td>150</td>
<td>$\degree\text{C}$</td>
</tr>
<tr>
<td>Maximum junction temperature</td>
<td>$T_J$</td>
<td>-55</td>
<td>165</td>
<td>$\degree\text{C}$</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>$T_{STG}$</td>
<td>-65</td>
<td>175</td>
<td>$\degree\text{C}$</td>
</tr>
</tbody>
</table>

Note: Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
**Thermal Characteristics**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Rating</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{QJA}$</td>
<td>VB Package thermal resistance</td>
<td>Single-layer PCB, with copper limited to solder pads</td>
<td>177</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{QJA}$</td>
<td>BU Package thermal resistance</td>
<td>Single-layer PCB, with copper limited to solder pads</td>
<td>140</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

**ESD Protection**

Human body model (HBM) tests according to: Standard EIA/JESD22-A114-B HBM

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD-Protection</td>
<td>$V_{ESD}$</td>
<td>-6</td>
<td>6</td>
<td>KV</td>
</tr>
</tbody>
</table>

**Functional Diagram**
## Terminal Configuration and Functions

**4-Terminal SIP**

**VB Package**

(Top View)

![Diagram of CYD8526](image)

### Pin Arrangement

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Pin (VB Package)</td>
<td>Description</td>
</tr>
<tr>
<td>V&lt;sub&gt;DD&lt;/sub&gt;</td>
<td>1</td>
<td>Power supply</td>
</tr>
<tr>
<td>Direction output</td>
<td>2</td>
<td>Output, OC, needs a pull-up resistor</td>
</tr>
<tr>
<td>Speed output</td>
<td>3</td>
<td>Output, OC, needs a pull-up resistor</td>
</tr>
<tr>
<td>GND</td>
<td>4</td>
<td>Ground terminal</td>
</tr>
</tbody>
</table>

3.5 to 24 V power supply

Direction output, OC, needs a pull-up resistor

Speed output, OC, needs a pull-up resistor

Ground terminal
Characteristic Data

**Quiescent Current versus Supply Voltage**

- $I_{DD} \approx 5 \text{mA}$ at $T_A = 25^\circ C$

**Quiescent Current versus Temperature**

- $I_{DD} \approx V_{cc} = 5 \text{V}$

**Saturation Voltage versus Supply Voltage**

- $V_{Sat} \approx 100 \text{mV}$ at $T_A = 25^\circ C$

**Saturation Voltage versus Temperature**

- $V_{Sat} \approx 100 \text{mV}$ at $T_A = 25^\circ C$

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Characteristic Data (Continued)

**B_{OP} and B_{AP} versus Temperature**

![Graph showing B_{OP} and B_{AP} versus temperature.]

**B_{HYS} versus Temperature**

![Graph showing B_{HYS} versus temperature.]

**Typical Application Circuit**

![Circuit diagram showing CYD8526 with connections for VDD, GND, and various components including 100 Ohm resistor, 0.1uF capacitor, 10K resistors, and 1nF capacitors for direction and speed.]
Typical Output Waveform

**Time**

- **S**
- **N**
- **S**
- **N**
- **S**
- **N**
- **S**
- **N**

**B**

**BOp**

**BRp**

**SPEED**

**DIRECTION**

**Time**

**Td**

Change Direction

**Td**

**Td**
Geometric Dimensions (Package)

4-Terminal VB Package  Dimension:mm

Pin 1: V_{DD} (Voltage Supply)  
Pin 2: Direction output  
Pin 3: Speed output  
Pin 4: GND (Ground)  

Notes:

1. Exact body and lead configuration at vendor’s option within limits shown  
2. Height does not include mold gate flash  
   Where no tolerance is specified, dimension is nominal