High Sensitivity Latching Hall-effect Digital Sensor ICs: VF360NT, VF360ST, VF460S

DESCRIPTION
The VF360NT, VF360ST, and VF460S High Sensitivity Latching Digital Hall-Effect Sensor ICs are small, sensitive and versatile devices that are operated by the magnetic field from a permanent magnet or an electromagnet. They are designed to respond to alternating North and South poles. The VF360NT is turned ON by a North pole, while the VF360ST and VF460S are turned ON by a South pole. This sensor IC does not use chopper stabilization on the Hall element, providing a clean output signal and a faster latch response time when compared to competitive high sensitivity Hall-effect latching sensor ICs which do use chopper stabilization.

VALUE TO CUSTOMERS
• AEC-Q100 qualification provides enhanced reliability and quality of electronic components. Components meeting these specifications are often suitable for use in harsh automotive environments without the customer’s need for additional component-level qualification testing.
• Designed to provide reliable, consistent performance and a fast response time, enhancing efficiency in brushless dc motor (BLDC) applications
• Designed to provide a wide supply voltage range and no chopper delay, allowing for potential use in a variety of applications
• Designed to provide a clean output signal without the customer having to include additional circuitry to achieve noise suppression due to chopper stabilization

DIFFERENTIATION
Honeywell’s VF360NT, VF360ST, and VF460S AEC-Q100-qualified latching sensor ICs offer better performance than many competitive sensor ICs that employ chopper stabilization techniques.
• Response time: Honeywell’s device provides a fast response time, enabling efficiency in BLDC motors.
• No noise generation: Honeywell’s device utilizes a resistor-capacitor (RC) circuit to enable noise suppression required for chopper stabilized sensors.

FEATURES
• Qualified to the AEC-Q100 standard for potential use in automotive applications
• Fastest response time in its class (1.5 µs)
• Operate from 30 Gauss typical at 25°C [77°F] and 55 Gauss maximum over the full -40°C to 150°C [-40°F to 302°F] temperature range
• Latching magnetics
• Repeatable magnetics (no jitter)
• No additional electronic noise generated by sensor
• Non-chopper-stabilized design
• VF360NT and VF360ST subminiature SOT-23 surface mount package supplied on tape and reel (3000 units per reel)
• VF460S flat TO-92-style package (1000 units per bag)
• 3 Vdc to 24 Vdc
• Built-in reverse polarity protection
• RoHS-compliant material

POTENTIAL TRANSPORTATION APPLICATIONS
• BLDC motor commutation for automotive applications: Air input flap to engine, convertible roof position, electronic parking brakes, electronic window lifts and anti-pinch power window systems, HVAC blowers, headlights, power doors, mirrors and tail gates, seat motors, steering, windshield washers and wipers
• Speed and RPM sensing: Motors and fans; tachometer and counter pickup
• Flow rate sensing

PORTFOLIO
The VF360NT, VF360ST, and VF460S are a part of Honeywell’s family of latching digital Hall-effect sensor ICs which also include:
• SS360NT, SS360ST, SS360ST-10K, SS460S, SS460S-T2, SS460S-LP
• SS360PT, SS460P, SS460P-T2
• SS361CT, SS461C
• SS361RT, SS461R
• SS400 Series, SS500 (select catalog listings)
• VF526DT (dual outputs)
High Sensitivity Latching Digital Hall-effect Sensor ICs: VF360NT, VF360ST, VF460S

Table 1. Electrical and Environmental Specifications
(At Vs = 3.0 Vdc to 24.0 Vdc, 20 mA load, T_a = -40ºC to 150ºC [-40ºF to 302ºF] except where otherwise specified.)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage:</td>
<td>VF360NT, VF360ST</td>
<td>3.0</td>
<td>—</td>
<td>24.0</td>
<td>Vdc</td>
</tr>
<tr>
<td></td>
<td>VF360NT, VF360ST</td>
<td>3.0</td>
<td>—</td>
<td>12.0</td>
<td>Vdc</td>
</tr>
<tr>
<td></td>
<td>VF460S</td>
<td>3.0</td>
<td>—</td>
<td>24.0</td>
<td>Vdc</td>
</tr>
<tr>
<td></td>
<td>V_supply = 3.0 Vdc at 25°C [77°F]</td>
<td>—</td>
<td>3.5</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td>Output current</td>
<td>—</td>
<td>—</td>
<td>20.0</td>
<td>—</td>
<td>mA</td>
</tr>
<tr>
<td>V_sat</td>
<td>Gauss &gt; 55</td>
<td>—</td>
<td>—</td>
<td>0.6</td>
<td>V</td>
</tr>
<tr>
<td>Output leakage current</td>
<td>Gauss &gt; -55</td>
<td>—</td>
<td>—</td>
<td>10.0</td>
<td>µA</td>
</tr>
<tr>
<td>Rise/fall time</td>
<td></td>
<td>—</td>
<td>—</td>
<td>1.5</td>
<td>µs</td>
</tr>
<tr>
<td>Thermal resistance:</td>
<td>VF360NT, VF360ST</td>
<td>303</td>
<td>—</td>
<td>—</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>VF460S</td>
<td>233</td>
<td>—</td>
<td>—</td>
<td>°C/W</td>
</tr>
<tr>
<td>Magnetic characteristics:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gauss</td>
</tr>
<tr>
<td>operate (Bop)</td>
<td>25°C [77°F]</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>Gauss</td>
</tr>
<tr>
<td>operate (Bop)</td>
<td></td>
<td>5</td>
<td>30</td>
<td>55</td>
<td>Gauss</td>
</tr>
<tr>
<td>release (Brp)</td>
<td>25°C [77°F]</td>
<td>-45</td>
<td>-30</td>
<td>-15</td>
<td>Gauss</td>
</tr>
<tr>
<td>release (Brp)</td>
<td></td>
<td>-55</td>
<td>-30</td>
<td>-5</td>
<td>Gauss</td>
</tr>
<tr>
<td>differential</td>
<td></td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>Gauss</td>
</tr>
<tr>
<td>Operating temperature</td>
<td></td>
<td>-40</td>
<td>—</td>
<td>150</td>
<td>°C [°F]</td>
</tr>
<tr>
<td>Storage temperature:</td>
<td>VF360NT, VF360ST</td>
<td>-40</td>
<td>—</td>
<td>150</td>
<td>°C [°F]</td>
</tr>
<tr>
<td></td>
<td>VF460S</td>
<td>-40</td>
<td>—</td>
<td>165</td>
<td>°C [°F]</td>
</tr>
<tr>
<td>ESD (Human Body Model)</td>
<td>per JEDEC JS-001, Class H3A/3A</td>
<td>-4</td>
<td>—</td>
<td>+4</td>
<td>kV</td>
</tr>
<tr>
<td>Soldering temperature and time:</td>
<td>VF360NT, VF360ST</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>VF460S</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

NOTICE
These Hall-effect sensor ICs may have an initial output in either the ON or OFF state if powered up with an applied magnetic field in the differential zone (applied magnetic field >Brp and <Bop). Honeywell recommends allowing 10 µs after supply voltage has reached 5 V (VF360NT, VF360ST) or 3 V (VF460S) for the output voltage to stabilize.

Table 2. Absolute Maximum Specifications

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>-26.0</td>
<td>—</td>
<td>26.0</td>
<td>V</td>
</tr>
<tr>
<td>Applied output voltage</td>
<td>-0.5</td>
<td>—</td>
<td>26.0</td>
<td>V</td>
</tr>
<tr>
<td>Output current</td>
<td>—</td>
<td>—</td>
<td>25</td>
<td>mA</td>
</tr>
<tr>
<td>Magnetic flux</td>
<td>—</td>
<td>—</td>
<td>no limit</td>
<td>Gauss</td>
</tr>
</tbody>
</table>

NOTICE
Absolute maximum ratings are the extreme limits the device will momentarily withstand without damage to the device. Electrical and mechanical characteristics are not guaranteed if the rated voltage and/or currents are exceeded, nor will the device necessarily operate at absolute maximum ratings.
High Sensitivity Latching Digital Hall-effect Sensor ICs: VF360NT, VF360ST, VF460S

Figure 1. Sensor IC Block Diagram

Figure 2. Typical Magnetic Characteristics vs Ambient Temperature at Supply Voltages

Figure 3. VF360NT, VF360ST Rated Supply Voltage vs Temperature
High Sensitivity Latching Digital Hall-effect Sensor ICs: VF360NT, VF360ST, VF460S

Figure 4. Sensor IC, Tape and Reel Mounting Dimensions (For reference only. mm/in)

VF360NT, VF360ST Sensor IC

VF360NT, VF360ST Pocket Tape

VF360NT, VF360ST Reel

Note: Ensure the minimum hole size in the PCB is 0.68 mm [0.027] dia. based on the IPC 2222 Level B standard.
Table 3. Order Guide

<table>
<thead>
<tr>
<th>Catalog Listing</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF360NT</td>
<td>High sensitivity latching, digital Hall-effect sensor IC, North pole activated, SOT-23 package, tape and reel packaging, 3000 units/reel</td>
</tr>
<tr>
<td>VF360ST</td>
<td>High sensitivity latching, digital Hall-effect sensor IC, South pole activated, SOT-23 package, tape and reel packaging, 3000 units/reel</td>
</tr>
<tr>
<td>VF460S</td>
<td>High sensitivity latching, digital Hall-effect sensor IC, South pole activated, flat TO-92-style package, straight leads, bulk packaging, 1000 units/reel</td>
</tr>
</tbody>
</table>
ADDITIONAL INFORMATION
The following associated literature is available on the Honeywell web site at sensing.honeywell.com:
- Product line guide
- Product range guide
- Product installation instructions
- Application notes:
  - Magnetic Position Sensing in Brushless DC Electric Motors
- Technical note:
  - Achieving High Sensitivity and Magnetic Stability without the Use of Chopper Stabilization in Latching Hall-Effect Sensors for Brushless DC Motor Applications

⚠️ WARNING
PERSONAL INJURY
DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.
Failure to comply with these instructions could result in death or serious injury.

⚠️ WARNING
MISUSE OF DOCUMENTATION
- The information presented in this datasheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.
Failure to comply with these instructions could result in death or serious injury.

Warranty/Remedy
Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell’s standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. The foregoing is buyer’s sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

For more information
Honeywell Sensing and Internet of Things services its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or the nearest Authorized Distributor, visit sensing.honeywell.com or call:
Asia Pacific  +65 6355-2828
Europe       +44 (0) 1698 481481
USA/Canada   +1-800-537-6945

Honeywell Sensing and Internet of Things
9680 Old Bailes Road
Fort Mill, SC 29707
www.honeywell.com