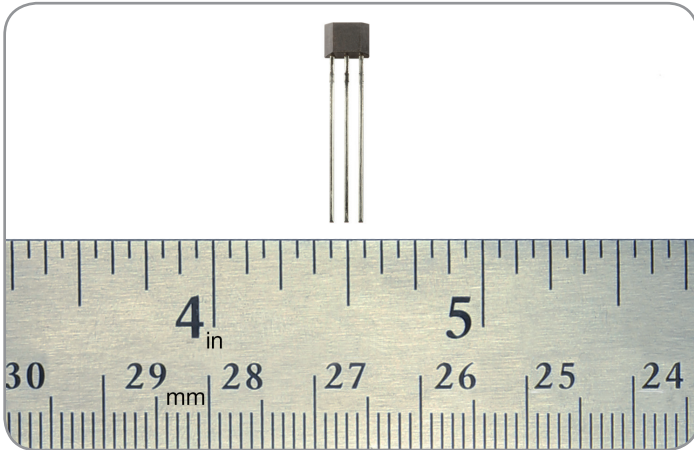


Bipolar Hall-Effect Digital Position Sensor ICs: SS40F, SS40AF

005888

Issue 4

Datasheet



DESCRIPTION

These small and versatile digital Hall-effect devices are operated by the magnetic field from a permanent magnet or an electromagnet, and are designed to respond to alternating North and South poles. The built-in regulator provides enhanced stability of operation from over a 4.5 Vdc to 24 Vdc supply voltage range, and internal circuitry is designed to prevent sensor damage in case the supply voltage polarity is accidentally reversed. The open-collector sinking output voltage is easily interfaced with a wide variety of electronic circuits. Both products are designed for high volume applications. The SS40F is factory tested at 25°C [77°F] and the SS40AF is factory tested at both 25°C [77°F] and 125°C [257°F]. These products are available in a flat TO-92-style package with straight leads in bulk packaging.

FEATURES

- Small, flat TO-92-style package size allows for a compact PC board layout
- Current consumption of only 5 mA max at 4.5 Vdc for energy efficiency
- Sensitive, bipolar magnetics respond to alternating North and South poles, making these products suited for speed sensing and RPM measurement
- High speed: operates from 0 kHz to over 100 kHz
- Built-in pull-up resistor can easily interface with common electronic circuits without adding external components, helping to reduce total system cost
- RoHS-compliant materials meet Directive 2002/95/EC

POTENTIAL APPLICATIONS

- **Commercial:** Door or lid closure detection in appliances, speed and RPM (revolutions per minute) sensing in fitness equipment, damper or valve position control in HVAC (heating, ventilation, and air conditioning) equipment, flow-rate sensing in appliances and water softeners, printer head position sensing
- **Industrial:** Flow rate sensing in industrial processes, robotic control (cylinder position monitoring), float-based fluid level sensing
- **Transportation:** Brushless dc motor commutation, electronic window lift, anti-pinch power window systems, vehicle convertible roof position
- **Medical:** Medical equipment using electric motors

PORTFOLIO

Other bipolar digital position sensor ICs include:

- SS400 Series, SS500 Series (selected catalog listings)
- SS311PT, SS411P
- SS41, SS41-L, SS41-T2, SS41-T3, SS41-S, SS41-SP
- SS51T
- SS30AT, SS40A, SS50AT

Bipolar Hall-Effect Digital Position Sensor ICs:

SS40F, SS40AF

Table 1. SS40F Performance Specifications

(At $V_s = 4.5$ Vdc to 24.0 Vdc, 20 mA load, $T_A = 25^\circ\text{C}$ [77°F] except where otherwise specified.)

Characteristic	Condition	Min.	Typ.	Max.	Unit
Supply voltage	—	4.5	—	24.0	Vdc
Supply current	—	—	6.8	10.0	mA
Output current	—	—	—	20.0	mA
V_{sat} at 15 mA	Gauss >170	—	—	0.4	V
Output leakage current	Gauss \leq -170	—	—	10.0	μA
Output switching time: rise	$V_s = 4.5$ Vdc	—	0.5	1.5	μs
fall	$V_s = 4.5$ Vdc	—	0.2	1.5	
Magnetic characteristics: operate (Bop)	—	—	45	110	Gauss
release (Brp)	—	-110	-45	—	
differential	—	50	—	—	
Operating temperature	—	-40 [-40]	—	125 [257]	$^\circ\text{C}$ [$^\circ\text{F}$]
Storage temperature	—	-55 [-67]	—	155 [311]	$^\circ\text{C}$ [$^\circ\text{F}$]
Soldering temperature and time	PC board wave soldering process: 250°C to 260°C [482°F to 500°F] for 3 s max.				

Table 2. SS40AF Performance Specifications

(At $V_{\text{supply}} = 4.5$ Vdc to 24.0 Vdc, 20 mA load, $T_A = -40^\circ\text{C}$ to 125°C [-40°F to 257°F] except where otherwise specified.)

Characteristic	Condition	Min.	Typ.	Max.	Unit
Supply voltage	—	4.5	—	24.0	Vdc
Supply current: output off	—	—	6.8	10.0	mA
output on	—	—	—	11.3	
Output current	—	—	—	20.0	mA
V_{sat} at 20 mA	$V_s = 12.0$ Vdc, Brp \geq 170, 25°C [77°F]	—	—	0.4	V
Output leakage current	$V_s = 24.0$ Vdc, Brp \leq -170	—	—	10.0	μA
Rise time	25°C [77°F]	—	0.5	1.5	μs
Fall time	25°C [77°F]	—	0.2	1.5	μs
Magnetic characteristics: operate (Bop)	25°C [77°F]	—	45	110	Gauss
operate (Bop)	-40°C to 85°C [-40°F to 185°F]	—	50	120	
operate (Bop)	—	—	55	170	
release (Brp)	25°C [77°F]	-110	45	—	
release (Brp)	-40°C to 85°C [-40°F to 185°F]	-130	50	—	
release (Brp)	—	-170	55	—	
differential	—	50	—	—	
Operating temperature	—	-40 [-40]	—	125 [257]	$^\circ\text{C}$ [$^\circ\text{F}$]
Storage temperature	—	-55 [-67]	—	155 [311]	$^\circ\text{C}$ [$^\circ\text{F}$]
ESD (Human Body Model)	per JEDEC JS-001	-3	—	+3	kV
Soldering temperature and time	PC board wave soldering process: 250°C to 260°C [482°F to 500°F] for 3 s max.				

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 4.5 V for the output voltage to stabilize.

NOTICE

The magnetic field strength (Gauss) required to cause the switch to change state (operate and release) will be as specified in the magnetic characteristics. To test the switch against the specified limits, the switch must be placed in a uniform magnetic field.



Bipolar Hall-Effect Digital Position Sensor ICs:

SS40F, SS40AF

Table 3. SS40F, SS40AF Absolute Maximum Specifications

Characteristic	Min.	Typ.	Max.	Unit
Supply voltage	-50.0	—	28	V
Applied output voltage	-0.5	—	28	V
Output current	—	—	20	mA
Magnetic flux	—	—	no limit	Gauss

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.

Figure 1. Current Sinking Output Block Diagram

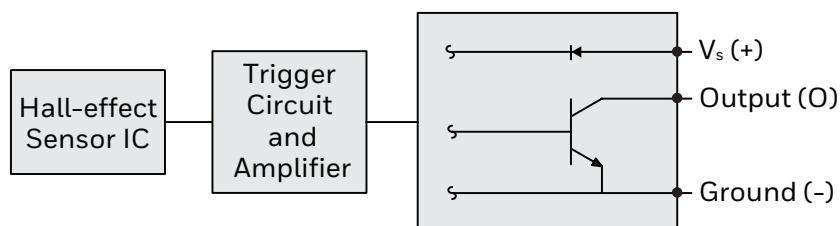
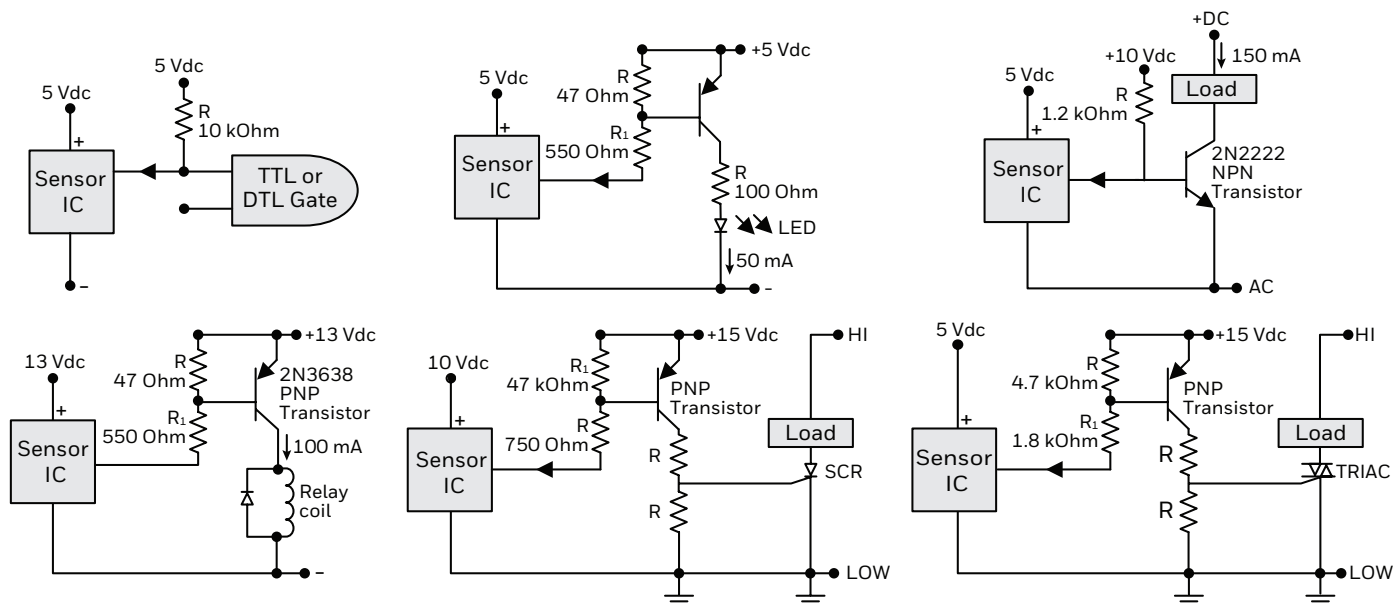


Figure 2. Wiring Diagrams



Bipolar Hall-Effect Digital Position Sensor ICs:

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Figure 3. Mounting and Dimensional Drawings (For reference only: mm/[in.])

SS40A, SS40AF: Straight Standard Leads, Bulk Pack

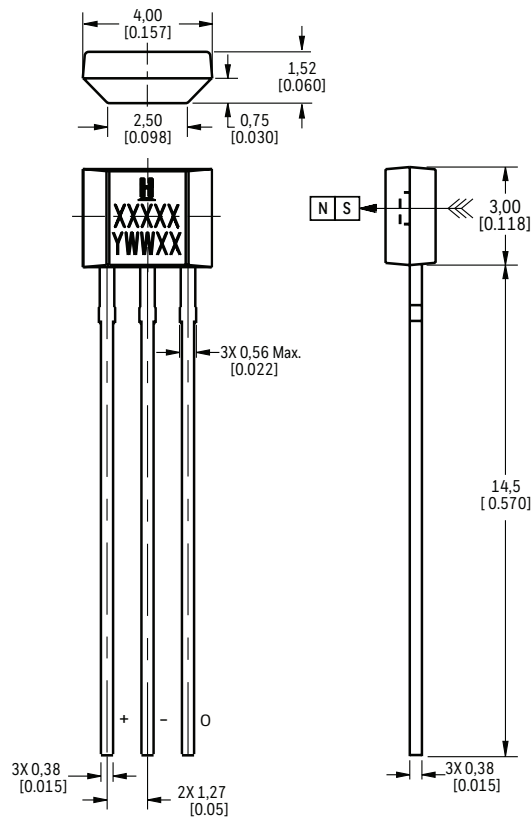



Table 4. Order Guide

Catalog Listing	Description	
SS40F	Bipolar Hall-effect digital position sensor IC, tested at 25°C [77°F], flat TO-92-style package, straight standard leads, bulk pack, 1000 units/bag	
SS40AF	Bipolar Hall-effect digital position sensor IC, tested at 25°C [77°F] and 125°C [257°F], flat TO-92-style package, straight standard leads, bulk pack, 1000 units/bag	

ADDITIONAL INFORMATION

The following associated literature is available on the Honeywell web site at sensing.honeywell.com:

- Product Line Guide
- Product Range Guide
- Selection Guides
- Application-specific Information

⚠ 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 during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment 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 that Honeywell, in its sole discretion, 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 Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility 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 writing. However, Honeywell assumes no responsibility for its use.

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