

# Bipolar, Latching, and Unipolar Hall-effect Digital

Position Sensor ICs: SS400 Series, SS500 Series

Issue B

Datasheet



### DESCRIPTION

The SS400 Series and SS500 Series are small and versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet, and are designed to respond to alternating North and South poles, or to a South pole only. They are available in bipolar, latching or unipolar magnetics. On-board regulation provides stable operation over a 3.8 Vdc to 30 Vdc supply voltage range. These sensors are capable of continuous 20 mA sinking output and may be cycled as high as 50 mA max. The 3.8 V capability allows for use in many potential low voltage applications. The digital, open collector sinking-type output is easily interfaced with a wide variety of electronic circuits. To provide reliable products and consistent quality, the SS400 Series products are tested at both 25°C [75°F] and 125°C [257°F]. All catalog listings are qualified for operation up to 150°C [302°F]. For design flexibility, these product are available in the following package styles:

- SS400 Series: Flat TO-92-style:
  - SS4XX: Straight standard leads, bulk pack
  - SS4XX-L: Straight long leads, bulk pack
  - SS4XX-T2: Formed leads, ammopack tape-in-box
  - SS4XX-T3: Straight standard leads, ammopack tape-in-box
  - SS4XX-S: Surface mount, bulk pack
  - SS4XX-SP: Surface mount, pocket tape and reel
- SS500 Series: SOT-89B, pocket tape and reel

### FEATURES

- Quad Hall IC design minimizes mechanical stress effects
- Temperature-compensated magnetics help provide stable operation over a wide temperature range of -40°C to 150°C [-40°F to 302°F]
- Broad, inclusive supply voltage capability from 3.8 Vdc to 30 Vdc for application flexibility
- Digital, open collector sinking output for easy interfacing with a variety of common electronic circuits
- High sensitivity versions available for potential applications requiring high accuracy or wide gaps
- Bipolar, latching or unipolar magnetics

### POTENTIAL APPLICATIONS

- Industrial: Speed and RPM (revolutions per minute) sensing, tachometer, counter pickup, flow-rate sensing, brushless dc (direct current) motor commutation, motor and fan control, robotics control
- **Transportation:** Speed and RPM (revolutions per minute) sensing, tachometer, counter pickup, motor and fan control, electric window lift, convertible roof position
- Medical: Motor assemblies, medication dispensing control

### PORTFOLIO

Other bipolar, latching and unipolar Halleffect digital sensor ICs include:

- SS360NT, SS360ST, SS360ST-10K, SS460S, SS460S-T2
- VF360NT, VF360ST, VF460S
- SS361RT, SS461R
- SS361CT, SS461C
- SS340RT, SS440R Series
- SS360PT, SS460P, SS460P-T2
- SS311PT, SS411P

SS400 Series, SS500 Series

Characteristic	Condition	Min.	Тур.	Max.	Unit	
Supply voltage $(V_s)^1$	-	3.8	_	30	Vdc	
Rated sinking current $(I_{sink})$	-	_	20	_	mA	
Current consumption:				10.0		
SS400 Series SS500 Series off:	V <sub>s</sub> = 30 Vdc, I <sub>sink</sub> = 20 mA, -40°C < 1 < 150°C, B > operate max. V <sub>s</sub> = 30 Vdc, -40°C < T < 150°C, B > operate max.	_	_	10.0	mA	
SS400 Series SS500 Series	V <sub>s</sub> = 30 Vdc, I <sub>sink</sub> = 20 mA, -40°C < T < 150°C, B > operate max. V <sub>s</sub> = 30 Vdc, I <sub>sink</sub> = 20 mA, -40°C < T < 150°C, B > release min.		_	9.0 10.0		
V <sub>sat</sub> : SS400 Series SS500 Series	V <sub>s</sub> = 3.8 Vdc, I <sub>sink</sub> = 20 mA, B > operate max. V <sub>s</sub> = 3.8 Vdc, B > operate max.			0.4 0.4	V	
Output leakage current: SS400 Series SS500 Series	V <sub>s</sub> = 24 V, Vout = 30 V, B < release min. —		_	0.4 10.0	uA	
Output switching time: rise fall	$V_s = 12 V, R_L = 1.6 kOhm, C_L = 20 pF, T = 25^{\circ}C [77^{\circ}F]$ $V_s = 12 V, R_L = 1.6 kOhm, C_L = 20 pF, T = 25^{\circ}C [77^{\circ}F]$			1.5 1.5	us	
Operating temperature	-	-40[-40]	_	150[302]	°C[°F]	
Storage temperature	-	-50[-58]	_	150[302]	°C[°F]	
Soldering temp. and time: SS400 Series SS500 Series	wave soldering process: 250°C to 260°C [482°F to 500°F] fo infrared reflow process: peak temperature 245°C [473°F] for	or 3 s max. 10 s max.				

### Table 1. Performance Specifications (Applies to both SS400 series and 500 Series, unless otherwise noted.)

<sup>1</sup>For supply voltages above 24 Vdc, a capacitor may be needed between the output and supply pins to ensure proper operation.

### 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 us after supply voltage has reached 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.



### Figure 1. Circuit Diagram



SS400 Series, SS500 Series

### **Table 2. Absolute Maximum Specifications**

Characteristic	Min.	Тур.	Max.	Unit
Supply voltage (V <sub>s)</sub>	-1	_	30	V
Applied output voltage (V <sub>out)</sub> : SS400 Series SS500 Series (off)	-0.5 —		30 30	V
Output current ( $I_{sink}$ ): $V_s = -1$ Vdc to 24 Vdc $V_s = 24$ Vdcto 25 Vdc $V_s = 25$ Vdc to 26 Vdc $V_s = 26$ Vdc to 27 Vdc $V_s = 27$ Vdc to 28 Vdc $V_s = 28$ Vdc to 29 Vdc $V_s = 29$ Vdc to 30 Vdc		    	50 37 33 28 24 19 15	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 2. Magnetic Activation



#### Figure 3. Circuit Diagrams



SS400 Series, SS500 Series

### Table 3. Magnetic Specifications

		Magnetic Characteristic (Gauss)													
ture		Bipolar			Unipolar				Latching						
Tempera	Operating Characteristic	SS411 SS511AT	SS413	SS513AT	SS441	SS541AT	SS443	SS543AT	SS449	SS549AT	SS461	SS561AT	SS466	SS566AT	
-40°C [-40°F]	operate: minimum maximum release: minimum maximum differential (min.)	NS 70 -70 NS 15	N 14 -14 N 2	IS 40 40 IS .0	5 13 2 12 1	0 35 0 20 5	11 21 8 19 2	10 15 0 90 5	28 43 21 30 3	35 35 10 60 0	5 110 -110 -5 50	- 100 -100 -5 50	10 20 -20 -10 20	)0 )0 )0 )0 )0	
0°C [0°F]	operate: minimum maximum release: minimum maximum differential (min.)	NS 65 -65 NS 15	N 14 -14 N 2	IS 40 40 IS 0	5 11 2 9 1	3 L7 0 9 5	11 19 8 16 2	LO 90 0 55 5	30 40 23 32 3	05 00 30 25 0	ب 9 -9 -5	5 0 90 5 0	10 18 -18 -10 20	100 185 -185 -100 200	
25°C [77°F]	operate: minimum maximum release: minimum maximum differential (min.)	NS 60 -60 NS 15	N 14 -1- N 2	IS 40 40 IS 0	5 11 2 9 2	5 15 0 5 0	11 18 7 15 2	10 30 5 55 5	3: 39 22 31 32	10 90 35 15 0	1 8 -{ -1 5	0 5 35 .0 0	10 18 -18 -10 20	)0 30 30 30 30 30	
85°C [185°F]	operate: minimum maximum release: minimum maximum differential (min.)	NS 60 -60 NS 12	N 14 -1- N 2	IS 40 40 IS 0	4 12 1 10 1	5 20 5 05 5	9 18 7 16 1	0 30 0 55 5	290 400 215 325 30	- 400 315 - 30	10 95 85 18 -85 -18 -10 -9 50 19		5 30 30 95 90		
125°C [257°F]	operate: minimum maximum release: minimum maximum differential (min.)	NS 65 -65 NS 12	N 14 -1- N 2	IS 40 40 IS 0	4 12 1 11 8	0 23 5 15 3	8 19 6 18 1	0 90 0 30 0	270 410 200 340 30	290 400 215 325 30	ب 1( -1ا 5	5 00 00 5 0	8 18 -18 -8 16	0 30 30 30 30 50	
150°C [302°F]	operate: minimum maximum release: minimum maximum differential (min.)	NS 70 -70 NS 10	N 14 -1- N 2	IS 40 40 IS 0	3 12 1 12 5	5 25 0 20 5	6 20 5 19	5 00 5 95 5	20 42 18 34 3	60 20 35 45 0	-1 -1 5	5 10 10 5 0	7 18 -18 -7 14	0 35 35 70 40	

SS400 Series, SS500 Series





SS400 Series, SS500 Series

Figure 5. SS400 Series Flat TO-92-Style Mounting and Dimensional Drawings (For reference only: mm/[in].)



SS4XX-T2: Formed Leads, Ammopack Tape-in-Box



SS400 Series, SS500 Series

Figure 5. SS400 Series Flat TO-92-Style Mounting and Dimensional Drawings (For reference only: mm/[in].)

SS4XX-T3: Straight Standard Leads, Ammopack Tape-in-Box





SS400 Series, SS500 Series

### Figure 5. SS400 Series Flat TO-92-Style Mounting and Dimensional Drawings (continued)

#### SS4XX-S: Surface Mount, Bulk Pack





#### SS4XX-SP: Surface Mount, Pocket Tape and Reel



SS400 Series, SS500 Series

Figure 6. SS500 Series Mounting and Dimensional Drawings (For reference only: mm/[in].)

#### SOT-89B Sensor IC, Pocket Tape and Reel



SS400 Series, SS500 Series

Table 4. Order Gu	iide for the SS400 Series (Flat TO-92-Style)		
<b>Catalog Listing</b>	Description	66 ( NY	CC/VV I
SS4XX: Straight	t standard leads, bulk pack, 1000 units/bag	554XX	554XX-L
SS411A	Bipolar		
SS413A	Bipolar	7-7-7	7-7-7-
SS441A	Unipolar		111
SS443A	Unipolar		
SS449A	Unipolar		
SS461A	Latching		
SS466A	Latching		
SS4XX-L: Straig	ght long leads, bulk pack, 1000 units/bag		
SS411A-L	Bipolar		
SS413A-L	Bipolar	1 1 1	
SS441A-L	Unipolar		
SS443A-L	Unipolar	SS4XX-T2	SS4XX-T3
SS449A-L	Unipolar	001/1/12	
SS461A-L	Latching	and the second sec	
SS4XX-T2: Forr	ned leads, ammopack tape-in-box, 5000 units/box		T
SS413A-T2	Bipolar	11	
SS441A-T2	Unipolar		
SS443A-T2	Unipolar		
SS449A-T2	Unipolar		
SS461A-T2	Latching		
SS4XX-T3: Stra	ight standard leads, ammopack tape-in-box, 5000 units/box		111
SS411A-T3	Bipolar		
SS413A-T3	Bipolar		
SS441A-T3	Unipolar		
SS443A-T3	Unipolar		
SS449A-T3	Unipolar		
SS461A-T3	Latching		
SS4XX-S: Surfa	ice mount, pocket tape and reel, bulk pack, 1000 units/bag		
SS411A-S	Bipolar		
SS413A-S	Bipolar		
SS441A-S	Unipolar		
SS443A-S	Unipolar	SS4XX-S	SS4XX-SP
SS449A-S	Unipolar	and the second se	
SS461A-S	Latching	A REAL PROPERTY AND A REAL PROPERTY A REAL PROPERTY AND A REAL PRO	
SS4XX-SP: Surfa	ace mount, pocket tape and reel, 1000 units/reel	111	
SS411A-SP	Bipolar	111	
SS413A-SP	Bipolar		
SS441A-SP	Unipolar		
SS443A-SP	Unipolar		
SS449A-SP	Unipolar		
SS461A-SP	Latching		

#### Table 5. Order Guide for the SS500 Series (SOT-89B, Pocket Tape and Reel, 1000 Units/Reel)

Catalog Listing	Description
SS511AT	Bipolar
SS513AT	Bipolar
SS541AT	Unipolar
SS543AT	Unipolar
SS549AT	Unipolar
SS561AT	Latching
SS566AT	Latching



#### 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

### A 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.

### A 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

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