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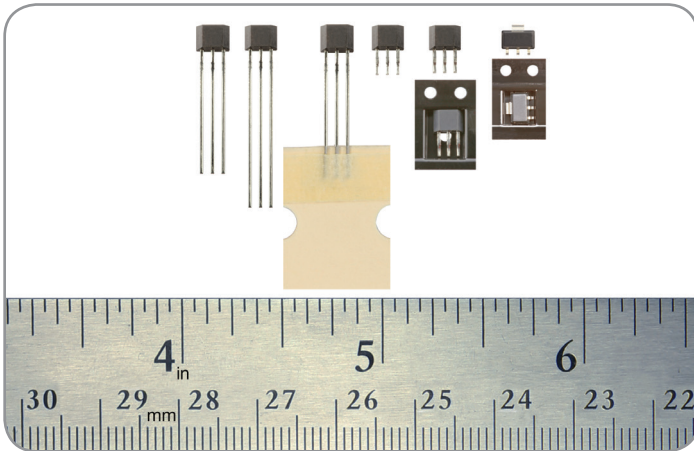
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Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs: SS400 Series, SS500 Series

32320997
Issue A



DESCRIPTION

The SS400 Series and SS500 Series are small, versatile, digital Hall-effect 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, 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 in the SS400 Series are qualified for operation up to 150 °C [302 °F].

For design flexibility, these product are available in the following package styles:

- **SS400 Series:**
 - **SS4XX:** 14,5 mm [0.57 in] straight standard leads, bulk pack, 1000 units/bag
 - **SS4XX-L:** 18,7 mm [0.74 in] straight long leads, bulk pack, 1000 units/bag
 - **SS4XX-T3:** 14,5 mm [0.57 in] straight standard leads, ammpack tape-in-box, 5000 units/box
 - **SS4XX-R:** 3,30 [0.130 in] straight reduced leads, bulk pack, 1000 units/bag
 - **SS4XX-SP:** 3,18 [0.125 in] surface mount, pocket tape and reel, 1000 units/reel
- **SS500 Series:** SOT-89B, pocket tape and reel, 1000 units/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] (SS400 Series) and -50 °C to 150 °C [-58 °F to 320 °F] (SS500 Series)
- 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 digital Hall-effect 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

Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

SS400 Series, SS500 Series

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

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage ¹	V_s	—	3.8	—	30	Vdc
Rated sinking current (I_{sink})	I_{sink}	—	—	20	—	mA
Current consumption:						
On:						
SS400 Series		$V_s = 30 \text{ Vdc}$, $I_{sink} = 20 \text{ mA}$, $-40 \text{ }^\circ\text{C} < T < 150 \text{ }^\circ\text{C}$, B > operate max.	—	—	10.0	mA
SS500 Series	—	$V_s = 30 \text{ Vdc}$, $-40 \text{ }^\circ\text{C} < T < 150 \text{ }^\circ\text{C}$, B > operate max.	—	—	10.0	
Off:						
SS400 Series		$V_s = 30 \text{ Vdc}$, $I_{sink} = 20 \text{ mA}$, $-40 \text{ }^\circ\text{C} < T < 150 \text{ }^\circ\text{C}$, B > operate max.	—	—	9.0	
SS500 Series		$V_s = 30 \text{ Vdc}$, $I_{sink} = 20 \text{ mA}$, $-40 \text{ }^\circ\text{C} < T < 150 \text{ }^\circ\text{C}$, B > release min.	—	—	10.0	
Vsat:						
SS400 Series	—	$V_s = 3.8 \text{ Vdc}$, $I_{sink} = 20 \text{ mA}$, B > operate max.	—	—	0.4	V
SS500 Series		$V_s = 3.8 \text{ Vdc}$, B > operate max.	—	—	0.4	
Output leakage current:						
SS400 Series	—	$V_s = 24 \text{ V}$, $V_{out} = 30 \text{ V}$, B < release min.	—	—	0.4	uA
SS500 Series		—	—	—	10.0	
Output switching time:						
rise	—	$V_s = 12 \text{ V}$, $R_L = 1.6 \text{ k}\Omega$, $C_L = 20 \text{ pF}$, $T = 25 \text{ }^\circ\text{C}$ [77 °F]	—	—	1.5	μs
fall		$V_s = 12 \text{ V}$, $R_L = 1.6 \text{ k}\Omega$, $C_L = 20 \text{ pF}$, $T = 25 \text{ }^\circ\text{C}$ [77 °F]	—	—	1.5	
Operating temperature:						
SS400 Series	T	—	-40 [-40]	—	150 [302]	°C [°F]
SS500 Series		—	-50 [-58]	—	150 [302]	
Storage temperature:						
SS400 Series	Ts	—	-50 [-58]	—	150 [302]	°C [°F]
SS500 Series		—	-65 [-85]	—	150 [302]	
Soldering temp. and time:						
SS400 Series	—	wave soldering process: 250 °C to 260 °C [482 °F to 500 °F] for 3 s max.				
SS500 Series		infrared reflow process: peak temperature 245 °C [473 °F] for 10 s max.				

¹For 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 μs 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.



Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

SS400 Series, SS500 Series

Table 2. Absolute Maximum Specifications

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_s	-1	—	30	V
Applied output voltage:					
SS400 Series	V_{out}	-0.5	—	30	V
SS500 Series (off)		—	—	30	
Output current:					
$V_s = -1$ Vdc to 24 Vdc		—	—	50	
$V_s = 24$ Vdc to 25 Vdc		—	—	37	
$V_s = 25$ Vdc to 26 Vdc		—	—	33	
$V_s = 26$ Vdc to 27 Vdc	I_{sink}	—	—	28	mA
$V_s = 27$ Vdc to 28 Vdc		—	—	24	
$V_s = 28$ Vdc to 29 Vdc		—	—	19	
$V_s = 29$ Vdc to 30 Vdc		—	—	15	
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. Circuit Diagram

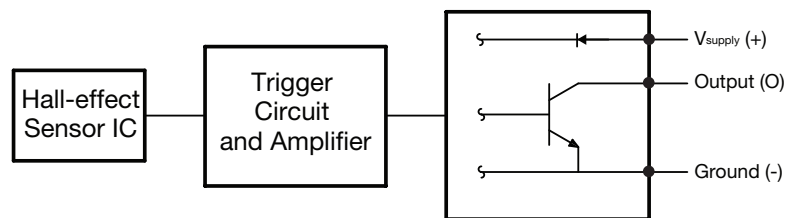
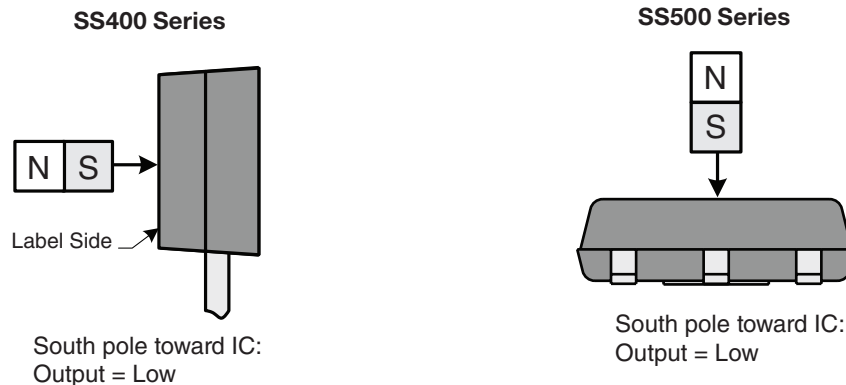


Figure 2. Magnetic Activation



Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

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Table 3. Magnetic Specifications

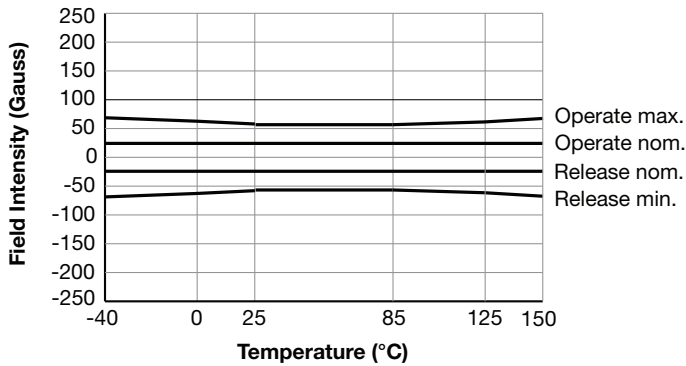
Temperature	Operating Characteristic	Magnetic Characteristic (Gauss)												
		Bipolar				Unipolar				Latching				
		SS411	SS511AT	SS413	SS513AT	SS441	SS541AT	SS443	SS543AT	SS449	SS549AT	SS461	SS561AT	SS466
-40 °C [-40 °F]	operate:													
	minimum	NS		NS		50		110		285		5	—	100
	maximum	70		140		135		215		435		110	100	200
	release:													
minimum	-70		-140		20		80		210		-110	-100	-200	
maximum	NS		NS		120		190		360		-5	-5	-100	
differential (min.)	15		20		15		25		30		50	50	200	
0 °C [0 °F]	operate:													
	minimum	NS		NS		53		110		305		5		100
	maximum	65		140		117		190		400		90		185
	release:													
minimum	-65		-140		20		80		230		-90		-185	
maximum	NS		NS		99		165		325		-5		-100	
differential (min.)	15		20		15		25		30		50		200	
25 °C [77 °F]	operate:													
	minimum	NS		NS		55		110		310		10		100
	maximum	60		140		115		180		390		85		180
	release:													
minimum	-60		-140		20		75		235		-85		-180	
maximum	NS		NS		95		155		315		-10		-100	
differential (min.)	15		20		20		25		30		50		200	
85 °C [185 °F]	operate:													
	minimum	NS		NS		45		90		290	—	10		95
	maximum	60		140		120		180		400	400	85		180
	release:													
minimum	-60		-140		15		70		215	315	-85		-180	
maximum	NS		NS		105		165		325	—	-10		-95	
differential (min.)	12		20		15		15		30	30	50		190	
125 °C [257 °F]	operate:													
	minimum	NS		NS		40		80		270	290	5		80
	maximum	65		140		123		190		410	400	100		180
	release:													
minimum	-65		-140		15		60		200	215	-100		-180	
maximum	NS		NS		115		180		340	325	-5		-80	
differential (min.)	12		20		8		10		30	30	50		160	
150 °C [302 °F]	operate:													
	minimum	NS		NS		35		65		260		5		70
	maximum	70		140		125		200		420		110		185
	release:													
minimum	-70		-140		10		55		185		-110		-185	
maximum	NS		NS		120		195		345		-5		-70	
differential (min.)	10		20		5		5		30		50		140	

Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

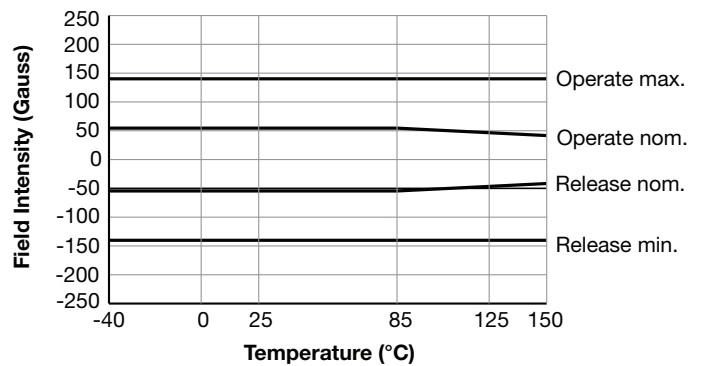
SS400 Series, SS500 Series

Figure 3. Operate and Release Point Performance Graphics

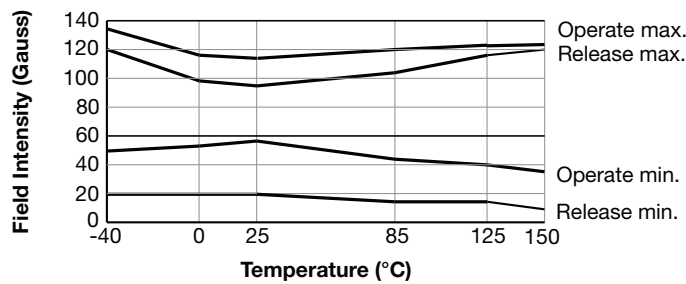
SS411/SS511AT



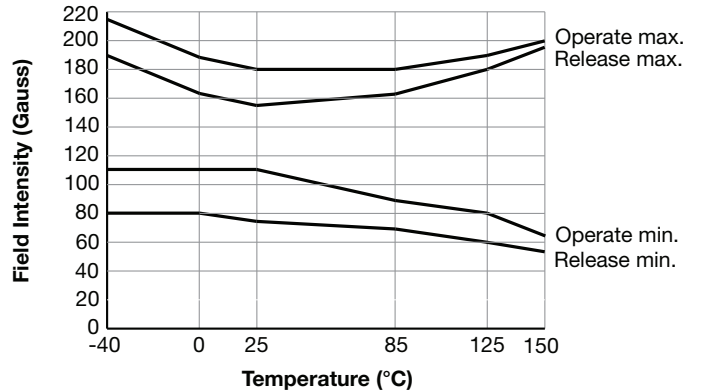
SS413/SS513AT



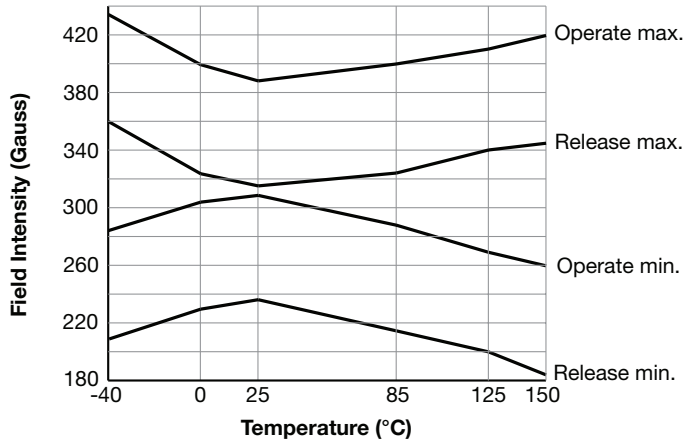
SS441/SS541AT



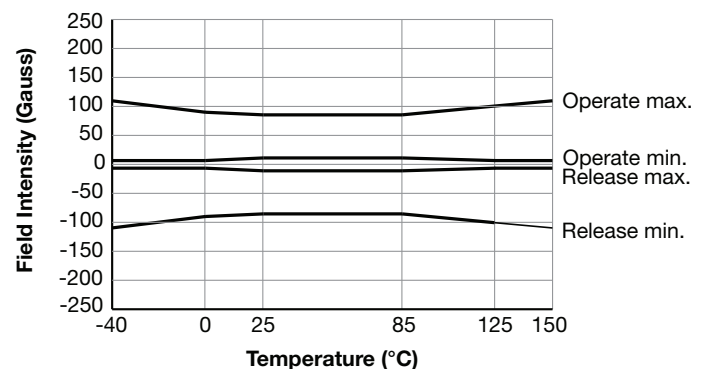
SS443/SS443AT



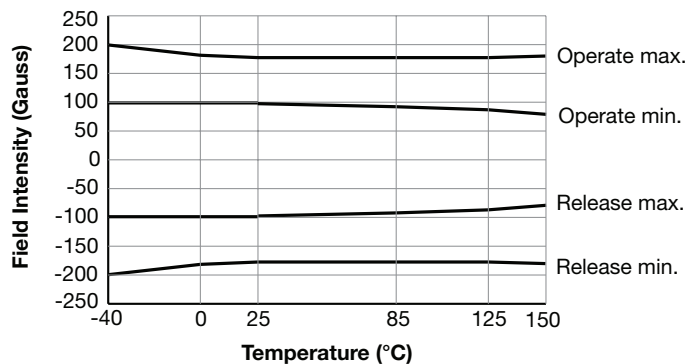
SS4449/SS549AT



SS461/SS561AT



SS466/SS566AT



Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

SS400 Series, SS500 Series

Figure 4. Circuit Diagrams

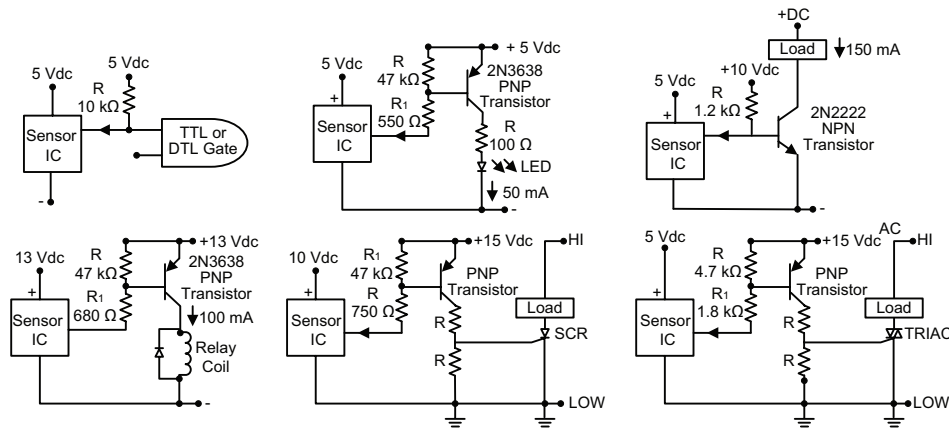
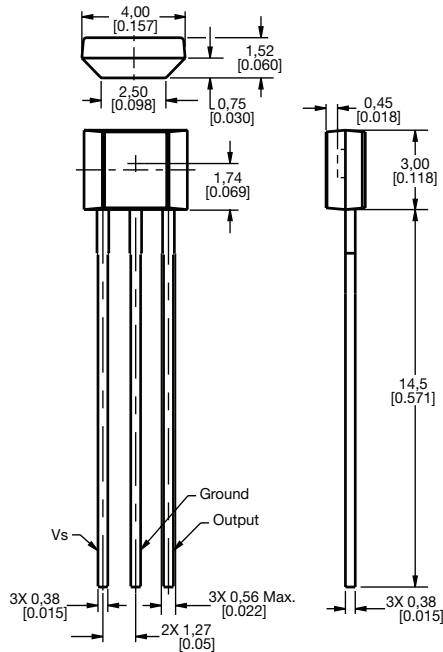
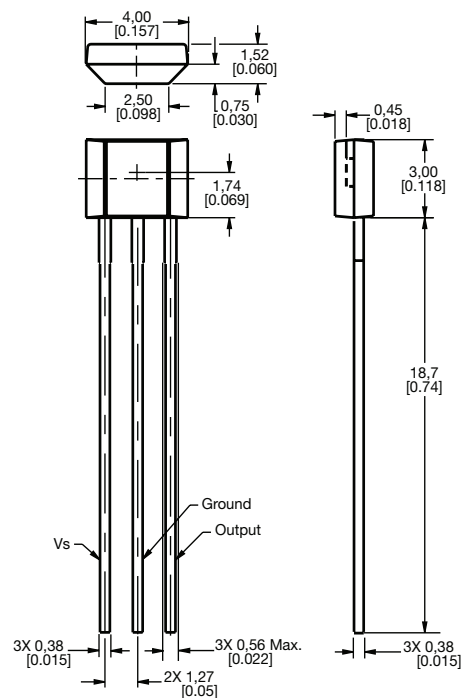


Figure 5. SS400 Series Flat TO-92-Style Mounting and Dimensional Drawings (For reference only: mm/[in].)

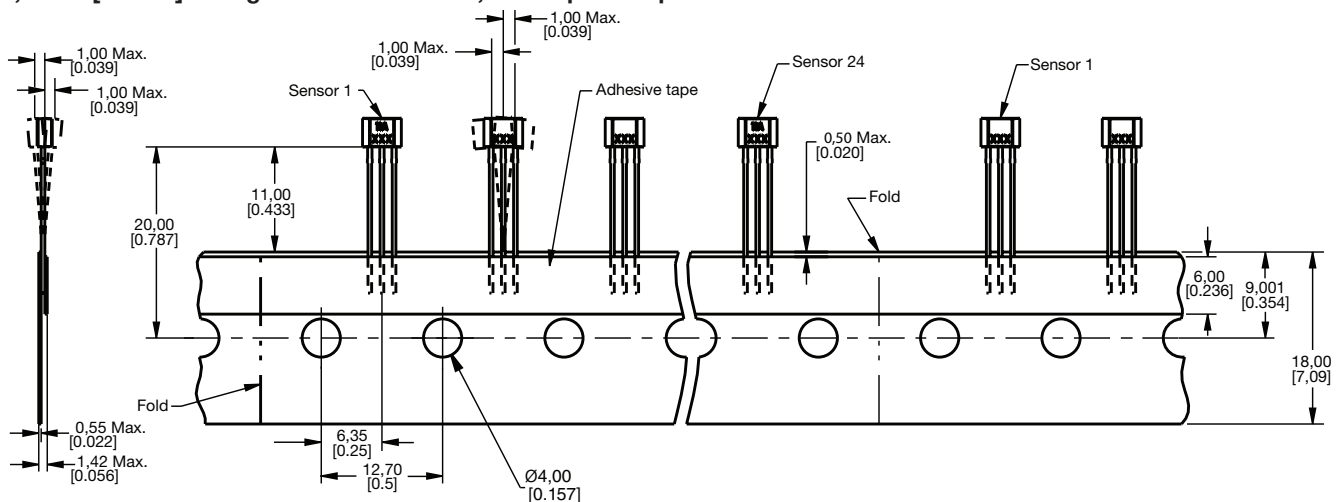
A: 14,5 mm [0.57 in] Straight Standard Leads Sensor IC, Bulk Pack



B: 18,7 mm [0.74 in] Straight Long Leads Sensor IC, Bulk Pack



C. 14,5 mm [0.57 in] Straight Standard Leads, Ammopack Tape-in-Box

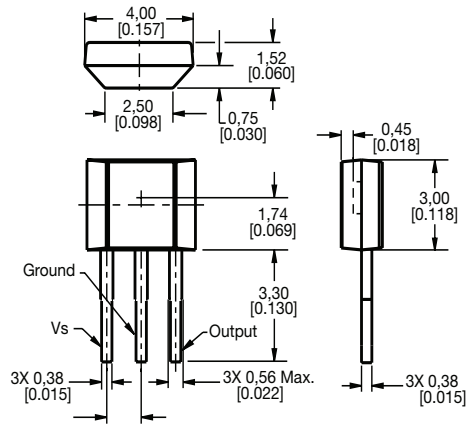


Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

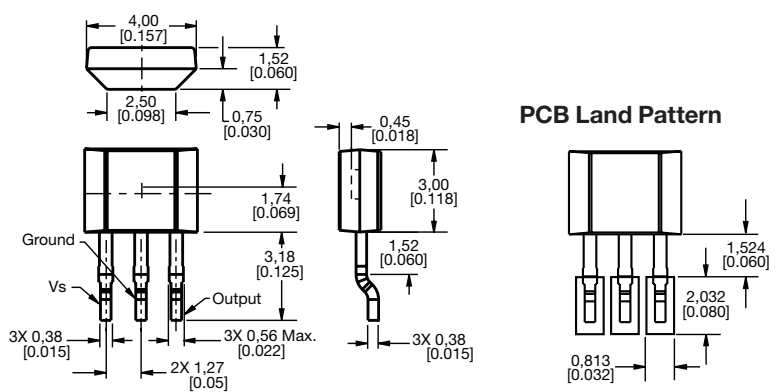
SS400 Series, SS500 Series

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

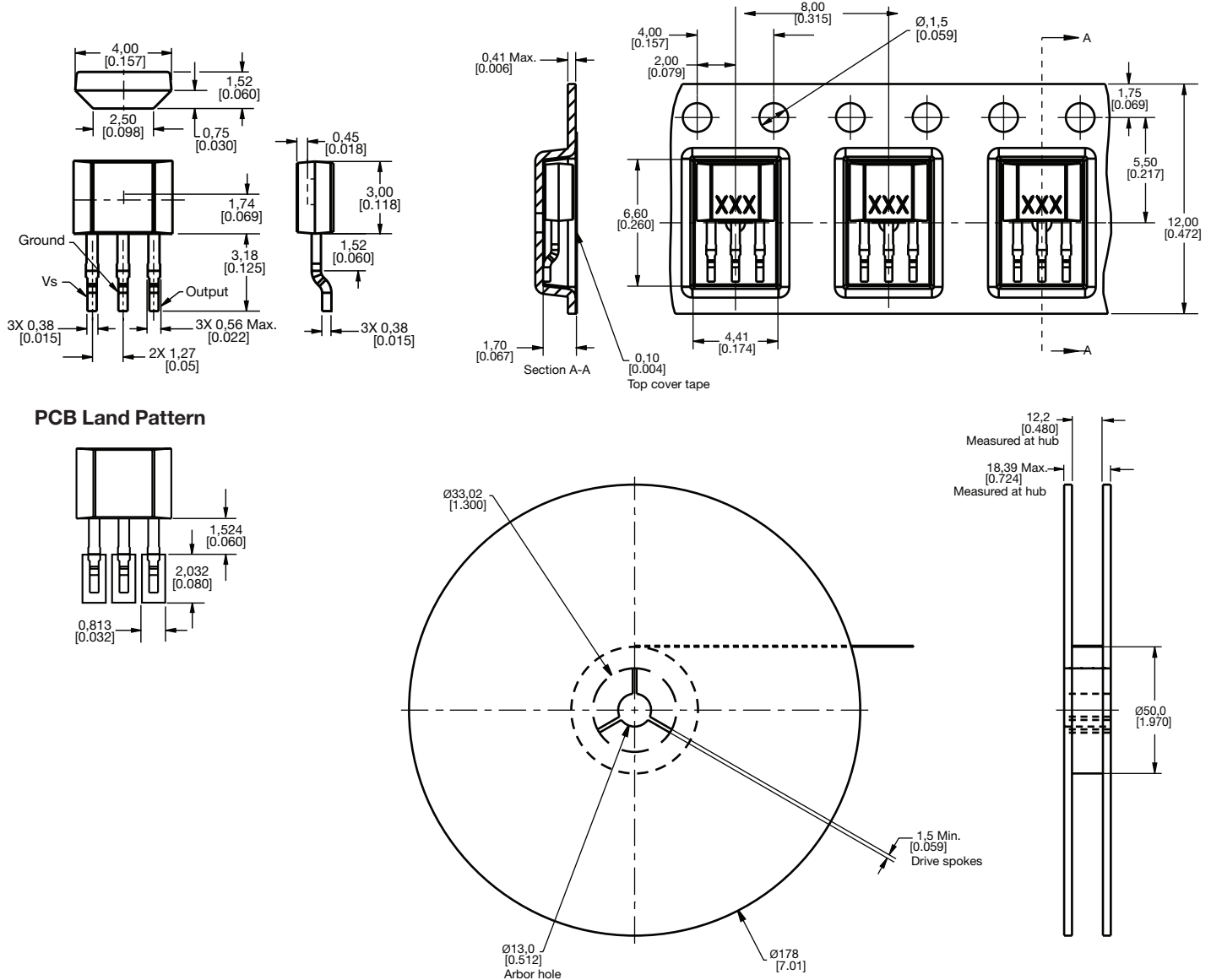
D. 3,30 [0.130 in] Straight Reduced Leads Sensor IC, Bulk Pack



E. 3,18 [0.125 in] Surface Mount Sensor IC, Bulk Pack



F. 3,18 [0.125 in] Surface Mount Sensor IC, Pocket Tape and Reel

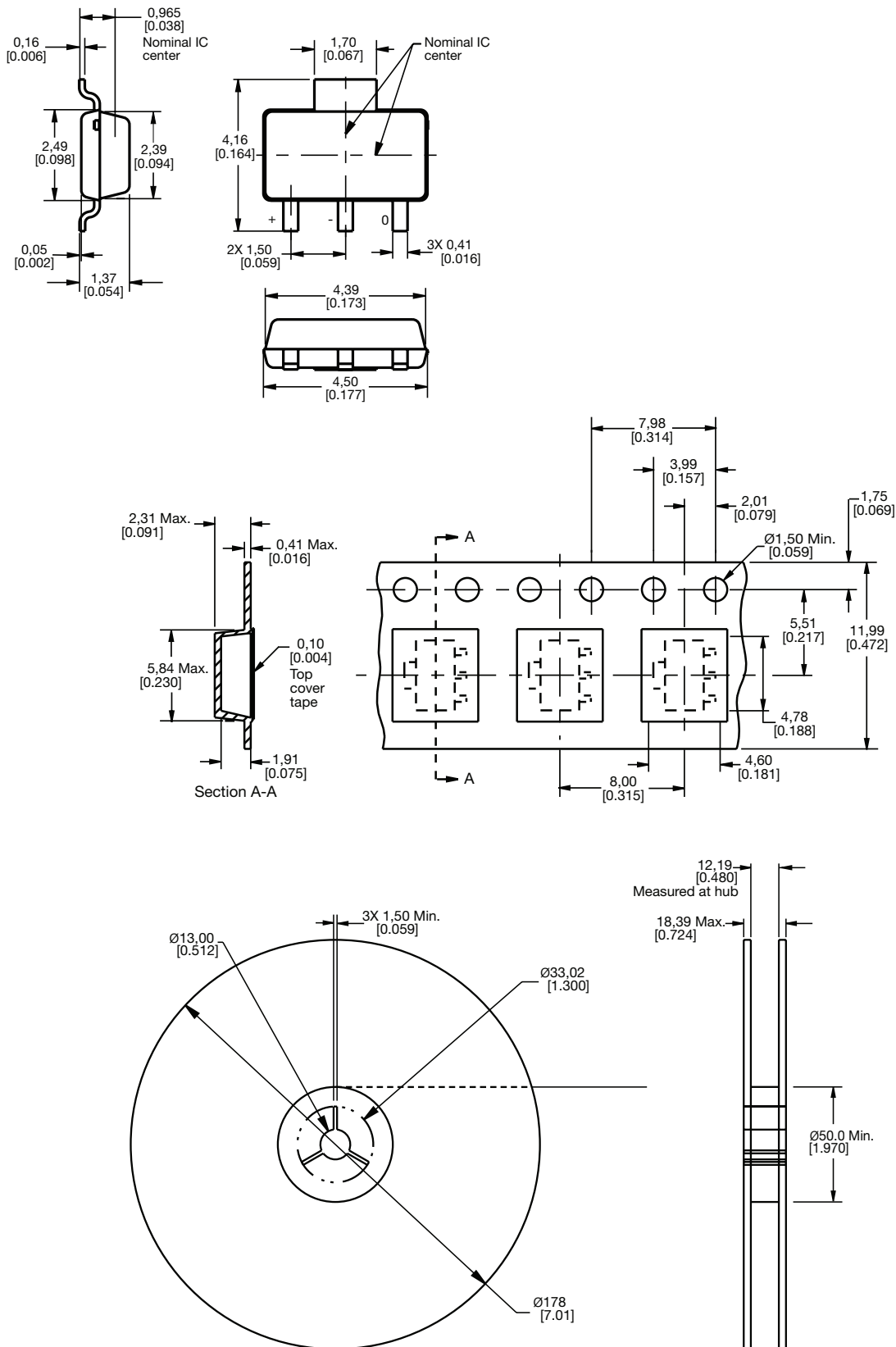


Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

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



Bipolar, Latching, or Unipolar Digital Hall-effect Sensor ICs:

SS400 Series, SS500 Series

Table 4. Order Guide for the SS400 Series (Flat TO-92-Style)



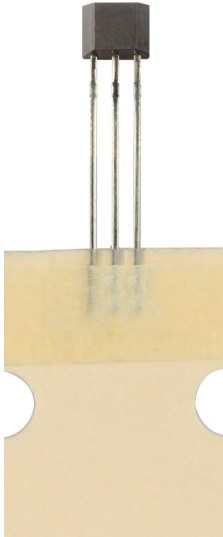


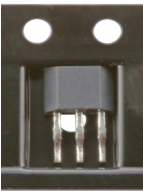

Catalog Listing	Description	SS4XX	SS4XX-L	SS4XX-T3
SS4XX: 14,5 mm [0.57 in] straight standard leads, bulk pack, 1000 units/bag				
SS411A	Bipolar			
SS413A	Bipolar			
SS441A	Unipolar			
SS443A	Unipolar			
SS449A	Unipolar			
SS461A	Latching			
SS466A	Latching			
SS4XX-L: 18,7 mm [0.74 in] straight long leads, bulk pack, 1000 units/bag				
SS461A-L	Latching			
SS4XX-T3: 14,5 mm [0.57 in] straight standard leads, ammpack tape-in-box, 5000 units/box				
SS443A-T3	Unipolar			
SS449A-T3	Unipolar			
SS4XX-R: 3,30 [0.130 in] straight reduced leads, bulk pack, 1000 units/bag				
SS411A-R	Bipolar			
SS4XX-S: 3,18 [0.125 in] surface mount, bulk pack				
SS411A-S	Bipolar			
SS443A-S	Unipolar			
SS449A-S	Unipolar			
SS4XX-SP: 3,18 [0.125 in] surface mount, pocket tape and reel, 1000 units/reel				
SS443A-SP	Unipolar			
SS449A-SP	Unipolar			

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

⚠ 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.

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