

# Magnetic Sensors Line Guide



**You know us as a leader**, whether you've known us as MICRO SWITCH™ or Honeywell Sensing and Control (S&C). In 1968, we revolutionized the industry with the first solid-state keyboard combining Hall-effect sensing and associated electronics in a single circuit. Today, the Honeywell S&C family of magnetic position sensors includes digital and analog Hall-effect position, magnetoresistive digital, Hall-effect vane, gear-tooth, and Hall-effect basic switches and magnets. These high-speed, extended life sensors are often directly compatible with other electronic

circuits, responding to the presence or the interruption of a magnetic field by producing a proportional output. Gear-tooth and other packaged Hall-effect speed and direction sensors sense movements of a ferrous metal target. Digital and analog “sensor-only” devices are operated by a permanent magnet or electromagnet, while actuation mode depends on the type of magnets used. A vane passing through a gap or a magnet mounted on a plastic plunger operates integral magnet position sensors.

## FEATURES

### LOW POWER HALL-EFFECT SENSOR ICS - DIGITAL SL353 Series.

**Features:** Energy efficient • Push-pull output • Non-chopper stabilized design • Omnipolar magnetics • Thermally balanced integrated circuit • Subminiature package size • Simple activation from a North pole or a South pole • Tape and reel packaging

**Benefits:** Supply voltage as low as 2.2 Vdc, combined with very low average current of 1.8  $\mu$ A typ., reduces power consumption, provides extended battery life, and promotes energy efficiency. Push-pull output does not require external pull-up resistor, simplifying interface with common electrical circuits and potentially reducing PC board space and costs to the customer. Does not utilize chopper stabilization, eliminating the noise generated by products using this technique, meaning that customers do not need filters to compensate for the noise. Omnipolar capability with high and low duty cycle options allows for use in a variety of potential applications with low power requirements and/or battery operation. Thermally balanced integrated circuit provides for stable operation over a wide

temperature range, of -40° to 85 °C [-40° to 185 °F]. SOT-23 subminiature package requires less PCB space, allowing for use in smaller assemblies. North pole or South pole operation does not require the magnet polarity to be identified, making installation easier and potentially reducing system costs. Supplied on tape and reel which allows for a compact design with automated component placement, helping to reduce manufacturing costs. Potential applications include motion control, lid closure detection, presence-absence, metering, and displacement sensing on battery-operated, mobile equipment such as computer notebooks, scanners, hand-held industrial computers, instrumentation and appliances.

### HALL-EFFECT SENSOR ICS - DIGITAL SS30AT/SS40A/SS50AT.

**Features:** Bipolar magnetics • Sinking output • High output current capability • High speed capability • Reverse polarity protection • Small through-hole and surface mount (SOT-23 and SOT-89) packages • Tape and reel available

**Benefits:** Integrated circuitry provides enhanced temperature stability in a robust

design. Thermally balanced integrated circuit over full temperature range. Built-in regulator provides stable operation over supply voltage range. Open-collector sinking output voltage easily interfaces with wide variety of electronic circuits. Internal circuitry prevents sensor damage in case supply voltage polarity is accidentally reversed. Potential applications include speed and RPM sensing, brushless dc motor commutation, motor and fan control, magnetic encoding, disc speed, tape rotation, and flow-rate sensing.

### SS311PT/SS411P.

**Features:** Bipolar magnetics • Enhanced sensitivity • Built-in pull-up resistor • Low voltage: 2.7 Vdc to 7 Vdc • Subminiature package size (SS311PT) • Through-hole and surface-mount (SOT-23 and SOT-89) packages • Cost effective

**Benefits:** Enhanced sensitivity often allows for use of smaller, less expensive magnets. Built-in pull-up resistor easily interfaces with common electronic circuits without adding external components, helping to reduce total system cost. 2.7 Vdc to 7 Vdc supply voltage range allows use in low voltage applications, promoting energy efficiency.

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## Precision. Repeatability. Ruggedness.

Each Honeywell S&C magnetic sensor IC is engineered to provide top performance:

**Hall-effect sensor ICs** are constructed from a thin sheet of conductive material with output connections perpendicular to the direction of current flow.

**Magnetoresistive sensor ICs** have a built-in magnetoresistive bridge integrated on silicon, encapsulated in a plastic package. The sensitive integrated circuit responds to low (25 G max.) fields at distances up to 1 inch.

**Hall-effect vane sensor ICs** consist of a magnet and a Hall-effect sensor inside a rugged plastic housing. Different package styles provide mounting flexibility.

**Gear tooth sensors** use a magnetically biased Hall-effect IC to sense movement of ferrous metal targets. The specially designed IC is sealed in a durable plastic probe-type package.

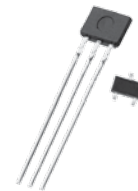
**Additional built-in benefits:** true solid state, extended life (30 billion operations in a module test program), high speed operation (over 100 kHz), stationary input (zero speed), no moving parts, logic compatible output, and broad temperature range (-40 °C to 150 °C, -40 °F to 302 °F).

## Low power Hall-effect sensor ICs - digital



### SL353 Series

<b>Description</b>	micropower omnipolar digital Hall-effect sensor IC
<b>Magnetic actuation type</b>	omnipolar
<b>Package material and style</b>	plastic surface mount (SOT-23)
<b>Supply voltage range</b>	2.2 Vdc to 5.5 Vdc
<b>Supply current</b>	SL353LT: 1.8 µA typ. at 2.8 Vdc SL353HT: 0.33 mA typ. at 2.8 Vdc
<b>Output type</b>	digital
<b>Operating temperature range</b>	-40 °C to 85 °C [-40 °F to 185 °F]

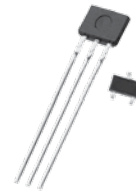
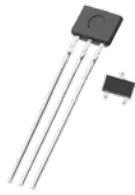


## Hall-effect sensor ICs - digital

### SS30AT/SS40A/SS50AT

### SS340RT/SS440R Series

<b>Description</b>	low-cost bipolar Hall-effect digital sensor IC	unipolar Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	bipolar	unipolar: SS340RT: North pole unipolar: SS440R: South pole
<b>Package material and style</b>	SS30AT: plastic surface mount (SOT-23) SS40A: plastic radial lead SS50AT: plastic surface mount (SOT-89B)	SS340RT: plastic surface mount (SOT-23) SS440R: plastic radial lead
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	3 Vdc to 24 Vdc, except SS340RT >125 °C [257 °F]: 3 Vdc to 12 Vdc
<b>Supply current</b>	10 mA max.	8 mA
<b>Output type</b>	digital sinking	digital sinking
<b>Operating temperature range</b>	SS40A: -40 °C to 125 °C [-40 °F to 257 °F] SS30AT/SS50AT: -40 °C to 125 °C [-40 °F to 257 °F]	SS440R (3 Vdc to 24 Vdc): -40 °C to 150 °C [-40 °F to 302 °F] SS340RT (3 Vdc to 24 Vdc): -40 °C to 125 °C [-40 °F to 257 °F] SS340RT (3 Vdc to 12 Vdc): -40 °C to 150 °C [-40 °C to 302 °F]



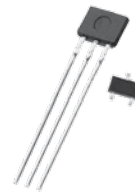
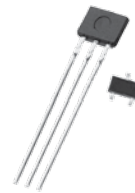
## Hall-effect sensor ICs - digital

### SS340RT/SS440R Series

### SS345PT/SS445P

### SS351AT/SS451A

<b>Description</b>	unipolar Hall-effect digital sensor IC	unipolar Hall-effect digital sensor IC	omnipolar Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	unipolar: SS340RT: North pole unipolar: SS440R: South pole	unipolar	omnipolar
<b>Package material and style</b>	SS340RT: plastic surface mount (SOT-23) SS440R: plastic radial lead	SS345PT: plastic surface mount (SOT-23) SS445P: plastic radial lead	SS351AT: plastic surface mount (SOT-23) SS451A: plastic radial lead
<b>Supply voltage range</b>	3 Vdc to 24 Vdc, except SS340RT >125 °C [257 °F]: 3 Vdc to 12 Vdc	2.7 Vdc to 7.0 Vdc	3 Vdc to 24 Vdc, except SS351AT >125 °C [257 °F]: 3 Vdc to 12 Vdc
<b>Supply current</b>	8 mA	14 mA	9 mA
<b>Output type</b>	digital sinking	digital sinking	digital sinking
<b>Operating temperature range</b>	SS440R (3 Vdc to 24 Vdc): -40 °C to 150 °C [-40 °F to 302 °F] SS340RT (3 Vdc to 24 Vdc): -40 °C to 125 °C [-40 °F to 257 °F] SS340RT (3 Vdc to 12 Vdc): -40 °C to 150 °C [-40 °C to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]	SS451A (3 Vdc to 24 Vdc): -40 °C to 150 °C [-40 °F to 302 °F] SS351AT (3 Vdc to 24 Vdc): -40 °C to 125 °C [-40 °F to 257 °F] SS351AT (3 Vdc to 12 Vdc): -40 °C to 150 °C [-40 °C to 302 °F]



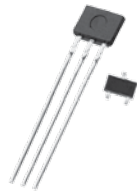
## Hall-effect sensor ICs - digital

### SS360NT/SS360ST/SS460S

### SS361CT/SS461C

<b>Description</b>	high sensitivity bipolar latching digital Hall-effect sensor IC	high sensitivity bipolar latching, Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	bipolar latching	bipolar latching
<b>Package material and style</b>	SS360NT/SS360ST: plastic surface mount (SOT-23) SS460: plastic radial lead	SS361CT: plastic surface mount (SOT-23) SS461C: plastic radial lead
<b>Supply voltage range</b>	3 Vdc to 24 Vdc	4 Vdc to 24 Vdc
<b>Supply current</b>	8 mA max.	6 mA max.
<b>Output type</b>	digital	digital sinking
<b>Operating temperature range</b>	-40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 125 °C [-40 °F to 257 °F]

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## Hall-effect sensor ICs - digital

### SS361RT/SS461R

### SS400/SS500 Series

<b>Description</b>	Hall-effect digital sensor IC	SS400: Hall-effect digital sensor IC SS500: unipolar/bipolar/bipolar latching Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	bipolar latching	unipolar, bipolar, bipolar latching
<b>Package material and style</b>	SS361RT: plastic surface mount (SOT-23) SS461R: plastic radial lead	SS400: plastic radial lead SS500: plastic surface mount (SOT-89)
<b>Supply voltage range</b>	3 Vdc to 18 Vdc, except SS361RT >125 °C [257 °F]: 3 Vdc to 12 Vdc	3.8 Vdc to 30 Vdc (inclusive)
<b>Supply current</b>	8 mA	SS400: 10 mA SS500: 8.7 mA at 5 Vdc
<b>Output type</b>	digital sinking	digital sinking
<b>Operating temperature range</b>	SS361RT (3 V to 12 V) & SS461R: 40 °C to 150 °C [-40 °C to 302 °C] SS361RT (3 V to 18 V): -40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 150 °C [-40 °F to 302 °F]



## Hall-effect sensor ICs - digital

### SS41/SS51T Series

### SS421 Series

### SS42R

### SS46

### VF526DT

<b>Description</b>	bipolar Hall-effect digital sensor IC	adjustable bipolar Hall-effect digital sensor IC with underspeed detection	bipolar latching Hall-effect digital sensor IC with dual active high/active low complementary outputs	bipolar latching Hall-effect digital sensor IC	bipolar latching dual Hall-effect digital sensor IC with speed and direction outputs
<b>Magnetic actuation type</b>	bipolar	bipolar	bipolar latching	bipolar latching	bipolar latching
<b>Package material and style</b>	SS41: plastic radial lead SS51T: plastic surface mount (SOT-89)	plastic radial lead	plastic radial lead	plastic radial lead	plastic surface mount (SOT-89)
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	4.5 Vdc to 16 Vdc	4.5 Vdc to 16 Vdc	4.5 Vdc to 24 Vdc	3.4 Vdc to 24 Vdc
<b>Supply current</b>	15 mA max.	15 mA max.	11 mA max.	10 mA max.	OFF: 12 mA max ON: 14 mA max
<b>Output type</b>	digital sinking	digital sinking	digital sinking or sourcing	digital sinking	digital voltage, dual open collector sinking
<b>Operating temperature range</b>	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 105 °C [-40 °F to 221 °F]	0 °C to 100 °C [32 °F to 212 °F]	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 125 °C [-40 °F to 257 °F]



## Hall-effect sensor ICs - linear

	91SS Series	SS490/SS491B Series	SS39ET/SS49E/ SS59ET Series	SS94 Series
<b>Description</b>	Hall-effect linear sensor IC	Hall-effect linear sensor IC	Hall-effect linear sensor IC	Hall-effect linear sensor IC
<b>Magnetic actuation type</b>	linear	linear	linear	linear
<b>Package material and style</b>	ceramic SIP, ceramic with solder bumps	SS490: plastic radial lead, plastic surface pack, ammopack styles T2 and T3 SS491B: plastic radial lead	SS39ET: plastic surface mount (SOT-23) SS49E: plastic radial lead (SOT-92-style) SS59ET: plastic surface mount (SOT-89)	ceramic SIP, ceramic with solder bumps
<b>Supply voltage range</b>	8 Vdc to 16 Vdc	4.5 Vdc to 10.5 Vdc	2.7 Vdc to 6.5 Vdc	4.5 Vdc to 12.6 Vdc
<b>Supply current</b>	19 mA max.	10 mA	10 mA max.	30 mA max.
<b>Output type</b>	ratiometric sourcing	ratiometric sinking or sourcing	ratiometric sourcing	ratiometric sinking or sourcing
<b>Operating temperature range</b>	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 100 °C [-40 °F to 212 °F]	-40 °C to 150 °C [-40 °F to 302 °F]



## Magnetoresistive sensor ICs

	2SS52M Series	SS552MT	VF401	APS00B
<b>Description</b>	omnipolar magnetoresistive digital sensor IC	omnipolar magnetoresistive digital sensor IC	2-wire MR fine-pitch ring magnet sensor IC	high resolution magnetic displacement sensor IC
<b>Magnetic actuation type</b>	omnipolar	omnipolar	differential bridge	analog, saturated mode
<b>Package material and style</b>	plastic radial leads	plastic SMT (SOT-89)	plastic flat, TO-92-style	plastic surface mount (SO-8)
<b>Supply voltage range</b>	3.8 Vdc to 30 Vdc	3.8 Vdc to 30 Vdc	4.5 Vdc to 16 Vdc	1 Vdc to 12 Vdc
<b>Supply current</b>	11 mA max.	11 mA max.	Icc operate: 16.8 mA max. Icc release: 8.4 mA max.	7 mA max.
<b>Output type</b>	digital sinking	digital sinking	digital current source	dual analog voltages responding to changes in magnetic field angle
<b>Operating temperature range</b>	-40 °C to 150 °C [-40 to 302 °F]	-40 °C to 150 °C [-40 to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]

# Magnetic Sensors Line Guide



## Value-added Hall-effect sensors

### 103SR Series (Digital)

### 103SR Series (Linear)

<b>Description</b>	Hall-effect digital position sensor	Hall-effect linear position sensor
<b>Package material and style</b>	aluminum threaded barrel	aluminum threaded barrel
<b>Magnetic actuation</b>	unipolar, bipolar, bipolar latch	linear
<b>Operation</b>	proximity to external magnet	proximity to external magnet
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	4.5 Vdc to 10.5 Vdc
<b>Supply current</b>	4 mA to 10 mA (inclusive)	7 mA
<b>Output type</b>	digital sinking	ratiometric sinking/sourcing
<b>Operating temperature range</b>	-40 °C to 100 °C [-40 °F to 212 °F]	-40 °C to 100 °C [-40 °F to 212 °F]



## Value-added Hall-effect sensors

### 1GT Series

### SR16/SR17 Series

<b>Description</b>	Hall-effect sensor	low-cost Hall-effect vane sensor
<b>Package material and style</b>	plastic probe	SR16: plastic dual tower with variety of terminations SR17: plastic side-mount wire exit
<b>Magnetic actuation</b>	–	–
<b>Operation</b>	ferrous metal actuator	ferrous metal actuator
<b>Supply voltage range</b>	4.5 Vdc to 26.5 Vdc (inclusive)	3.8 Vdc to 30 Vdc
<b>Supply current</b>	20 mA max.	10 mA max.
<b>Output type</b>	digital sinking	digital sinking
<b>Operating temperature range</b>	-40 °C to 150 °C [-40 °F to 302 °F]	-20 °C to 85 °C [-4 °F to 185 °F]



## Value-added Hall-effect sensors

### SR3 Series

### SR4 Series

<b>Description</b>	Hall-effect digital position sensor	magnetoresistive digital position sensor
<b>Package material and style</b>	plastic threaded barrel	plastic threaded barrel
<b>Magnetic actuation</b>	unipolar, bipolar	omnipolar
<b>Operation</b>	proximity to external magnet	proximity to external magnet
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	3.8 Vdc to 30 Vdc
<b>Supply current</b>	10 mA	11 mA
<b>Output type</b>	digital sinking	digital sinking
<b>Operating temperature range</b>	-40 °C to 85 °C [-40 °F to 185 °F]	-40 °C to 85 °C [-40 °F to 185 °F]



## Speed and direction sensors

### 1GT Series

<b>Description</b>	single Hall-effect sensor
<b>Supply voltage range</b>	4.5 Vdc to 26.5 Vdc (inclusive)
<b>Supply current</b>	20 mA
<b>Output type</b>	digital sinking (open collector)
<b>Operating frequency range</b>	0 Hz to 25 kHz (inclusive)
<b>Operating temperature range</b>	-40 °C to 150 °C [-40 °F to 302 °F]



## Speed and direction sensors

### LCZ Series



### SNDH-T Series



### SNDH-H Series

<b>Description</b>	single Hall-effect zero speed sensor	dual differential Hall-effect quadrature speed and direction sensor	Hall-effect speed sensor
<b>Housing</b>	stainless steel	n/a	stainless steel or plastic
<b>Supply voltage range</b>	4.5 Vdc to 26 Vdc	4.5 Vdc to 18 Vdc	4 Vdc to 24 Vdc (inclusive)
<b>Supply current</b>	20 mA	18 mA max.	20 mA max.
<b>Output type</b>	digital sinking	square wave	digital sinking
<b>Operating frequency range</b>	0 Hz to 15 kHz	1 Hz to 15 kHz	0 Hz to 15 kHz, 2 Hz to 15 kHz
<b>Operating temperature range</b>	-40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]



## Speed and direction sensors

### ZH10



### GTN Series



### SNDJ Series

<b>Description</b>	single Hall-effect zero speed sensor	single Hall-effect sensor	zero speed Hall-effect sensor, differential Hall-effect sensor, dual Hall-effect sensor
<b>Housing</b>	aluminum	n/a	n/a
<b>Supply voltage range</b>	4 Vdc to 24 Vdc	8 Vdc to 32 Vdc (inclusive)	8 Vdc to 32 Vdc (inclusive)
<b>Supply current</b>	6 mA	40 mA	10 mA to 20 mA max. (inclusive)
<b>Output type</b>	digital sinking	digital sinking (open collector)	square wave and one direction signal, square wave signal from NPN output transistor with 2.7 kOhm pull-up, dc-coupled to supply, square wave signal from push-pull stage, dc-coupled to supply
<b>Operating frequency range</b>	0 Hz to 15 kHz	2 Hz to 9 kHz	0 Hz to 15 kHz (inclusive)
<b>Operating temperature range</b>	-40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 125 °C [-40 °F to 257 °F]	-20 °C to 100 °C [-4 °F to 212 °F]



**Variable reluctance speed sensors**

**VRS General Purpose Series**

**VRS Hazardous Location Series**

<b>Output voltage range</b>	8 Vp-p to 40 Vp-p (inclusive)	30 Vp-p to 60 Vp-p (inclusive)
<b>Housing diameter</b>	5/8 in, 3/8 in, 1/4 in, 10/32 in	3/4 in, 5/8 in
<b>Housing material and style</b>	stainless steel threaded or smooth	stainless steel threaded
<b>Termination</b>	MS3106 connector, preleaded	MS3106 connector, preleaded
<b>Operating temperature range</b>	-55 °C to 120 °C [-67 °F to 250 °F] (inclusive)	-73 °C to 120 °C [-100 °F to 250 °F] (inclusive)



**Variable reluctance speed sensors**

**VRS High Output Series**

**VRS High Resolution Series**

<b>Output voltage range</b>	8 Vp-p to 190 Vp-p (inclusive)	17 Vp-p to 170 Vp-p
<b>Housing diameter</b>	5/8 in, 3/8 in	5/8 in, 3/8 in
<b>Housing material and style</b>	stainless steel threaded or smooth	stainless steel threaded
<b>Termination</b>	MS3106 connector, preleaded	MS3106 connector, preleaded
<b>Operating temperature range</b>	-55 °C to 150 °C [-67 °F to 300 °F] (inclusive)	-55 °C to 120 °C [-67 °F to 250 °F]



**Variable reluctance speed sensors**

**VRS High Temperature Series**

**VRS Power Output Series**

<b>Output voltage range</b>	4.7 Vp-p to 125 Vp-p (inclusive)	70 Vp-p (inclusive)
<b>Housing diameter</b>	5/8 in, 3/8 in, 1/4 in	5/8 in
<b>Housing material and style</b>	stainless steel threaded	stainless steel threaded
<b>Termination</b>	MS3106 connector, preleaded	MS3106 connector, preleaded
<b>Operating temperature range</b>	-73 °C to 230 °C [-100 °F to 450 °F] (inclusive)	-55 °C to 120 °C [-67 °F to 250 °F]



Subminiature package size (SS311PT) allows for compact design. SS311PT is available on tape and reel for high volume, automated component placement, helping to reduce manufacturing costs. Potential applications include speed and RPM sensing, brushless dc motor commutation, tachometer, counter pickup, motor and fan control, flow-rate sensing, and robotics control.

### **SS340RT/SS440R Series.**

**Features:** Unipolar magnetics: SS340RT responds to North pole; SS440R responds to South pole • Subminiature package size (SS340RT) • Multiple magnetic sensitivities (high, medium and low) • Low voltage 3 V capability • Built-in reverse polarity protection • Thermally balanced integrated circuit over full temperature range

**Benefits:** Supplied in three different magnetic sensitivities to meet wide range of potential applications. The SS341RT and SS441R offer the highest sensitivity, with a typical operating point of 85 G at 25 °C [77 °F]; the SS343RT and SS443R offer medium sensitivity with 125 G typical at 25 °C [77 °F]; the SS349RT and SS449R offer the lowest sensitivity, requiring 350 G typical to operate at 25 °C [77 °F]. The SS340RT's small size requires less PC board space, allowing it to be used in smaller assemblies. Its 3 V capability allows for use in low voltage applications, promoting energy efficiency. The SS340RT Series is available on tape and reel (3000 units per reel); the SS440R Series is available in a bulk package (1000 units per bag). Potential applications include door or lid closure detection, speed and RPM sensing in fitness equipment, flow rate sensing, damper or valve position control, cylinder position monitoring, float-based fluid level sensing and printer head position sensing.

### **SS345PT/SS445P.**

**Features:** unipolar magnetics

- Subminiature package size (SS345PT)
- Tape and reel packaging (SS345PT)
- Small, flat TO-92-style package (SS445P)
- Simple activation from a North pole (SS345PT) or a South pole (SS445P) • Low voltage 2.7 V capability • Built-in pull-up resistor

**Benefits:** Subminiature package size (SS345PT) uses less space on the PCB than standard Hall-effect sensor packages such as TO-92 or SOT-89, allowing for use in smaller assemblies. Tape and reel packaging (SS345PT) allows for automated component placement, helping to reduce manufacturing costs. Small, flat TO-92-style package (SS445P) is also available. 2.7 Vdc to 7 Vdc capability allows for use in low voltage applications, promoting energy efficiency. Built-in pull-up resistor can easily interface with common electronic circuits without adding external components, helping to reduce total system cost. Simple activation from a North pole (SS345PT) or a South pole (SS445P). Potential applications include speed and RPM sensing in fitness equipment, flow rate sensing in appliances and industrial processes, displacement sensor in hospital beds and medical equipment and medication bin monitor on portable drug carts.

### **SS351AT/SS451A.**

**Features:** Omnipolar magnetics

- Subminiature package size (SS351AT)
- Simple activation from either South pole or North pole • Low voltage 3 V capability
- Built-in reverse polarity protection
- Thermally balanced integrated circuit over full temperature range

**Benefits:** Available in two package styles: SS351AT in the subminiature SOT-23 surface mount; the SS451A in the leaded, flat TO-92-style. The SS351AT's small size requires less PC board space, allowing it to be used in smaller assemblies. Its 3 Vdc capability allows for use in low voltage applications, promoting energy efficiency. Subminiature package size (SS351AT) supplied on tape and reel allows for a compact design with automated component placement, helping to reduce manufacturing costs. Operated by a North pole or a South pole, these products do not require the magnet polarity to be identified, thus making the installation easier and potentially reducing system cost. Built-in reverse polarity protection protects the device from potential damage during installation. Thermally balanced integrated circuit provides for stable operation over a wide temperature range.

Potential applications include speed and RPM (revolutions per minute) sensing in fitness equipment, magnetic encoder for building access, damper or valve position control in HVAC (heating, ventilation and air conditioning) equipment, flow rate sensing in appliances and industrial processes, robotic control (cylinder position monitoring), displacement sensor in hospital beds, and medical equipment.

### **SS360NT/SS360ST/SS460S.**

**Features:** Fastest response time in its class • No chopper stabilization • High sensitivity • Bipolar latching magnetics • Sub-miniature, SOT-23 surface mount package (SS360NT/SS360ST) supplied on tape and reel • Small, leaded, flat TO-92-style package (SS460S) • Wide operating voltage range of 3 Vdc to 24 Vdc • Built-in reverse voltage • Durable design • RoHS-compliant material meets Directive 2002/95

**Benefits:** Fastest response time in its class provides more efficiency in commutating brushless dc motors. No chopper stabilization results in a clean output signal. Operates from only 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, allowing for the use of smaller, magnets or a wider air gap. Bipolar latching magnetics make these products well-suited for accurate speed sensing and RPM measurement; the SS360NT is turned ON by a North pole while the SS360ST and SS460S are turned ON by a South pole. Small size allows for compact design with automated component placement, as well as compact PC board layout. Wide operating voltage range allows for potential use in a wide range of applications. Built-in reverse voltage enhances the protection of the sensor and the circuits. Durable design allows operation up to 150 °C [302 °F]. Potential applications include industrial/commercial brushless dc motor commutation, flow rate sensing and motor and fan control; transportation speed and RPM sensing, tachometer, counter pickup and convertible roof position; medical equipment using electric motors.

### **SS361CT/SS461C.**

**Features:** Enhanced sensitivity • Bipolar latching magnetics • Subminiature package size with tape and reel packaging (SS361CT) • Small, flat TO-92-style package (SS461C) • Simple activation from a North pole (SS361CT) or a South pole (SS461C) • Built-in reverse voltage capability

**Benefits:** Enhanced sensitivity allows operation from only 50 G typ. at 25°C [77 °F], 80 G max. at 60 °C to 85 °C [140 °F to 185 °F], and 95 Gauss over the full temperature range of -40 °C to 125 °C [-40 °F to 257 °F], allowing the use of smaller, potentially lower-cost magnets or wider air gaps. Wide operating voltage range of 4 Vdc to 24 Vdc for use in wide range of potential applications. Subminiature package size (SS361CT) uses less space on the PCB than standard Hall-effect sensor packages such as TO-92 or SOT-89, allowing for use in smaller assemblies. Tape and reel packaging (SS361CT) allows for automated component placement, helping to reduce manufacturing costs. Small, flat TO-92-style package (SS461C) is also available. Built-in reverse voltage capability enhances protection of sensor and circuits with which it is used. Bipolar latching magnetics respond to alternating North and South poles, making these products well-suited for accurate speed sensing and RPM measurement. Potential applications include tachometer, counter pickup, motor and fan control, flow-rate sensing for appliances, robotics control, and medical equipment using electric motors.

### **SS361RT/SS461R.**

**Features:** Bipolar latching magnetics • Enhanced sensitivity • Subminiature package size (SS361RT) • Low voltage: 3 V operation • Built-in reverse polarity protection • Robust design: will operate up to 150 °C [302 °F] • Through-hole and surface-mount (SOT-23 and SOT-89) packages

**Benefits:** Enhanced sensitivity often allows for the use of less expensive magnets. Small size requires less PC board space, allowing it to be used in smaller assemblies. 3 V capability allows for use in

low voltage applications, promoting energy efficiency. Available on tape and reel for most high volume applications. Potential applications include speed and RPM sensing, brushless dc motor commutation, tachometer, counter pickup, motor and fan control, electric window lift, convertible roof position and automotive transmission position detection, flow-rate sensing, robotics control.

### **SS400/SS500 Series.**

**Features:** Unipolar, bipolar latching magnetics • Sinking output • Multiple operate/release points available • Temperature compensated magnetics with negative slope • High output current capability • Small through-hole and surface-mount (SOT-89) packages • Tape and reel available

**Benefits:** Quad Hall element design minimizes effects of mechanical or thermal stress on output and provides stable output. Negative compensation slope optimized to match negative temperature coefficient of lower cost magnets, providing robust design over wide temperature range. Band gap regulation provides stable operation over supply voltage range. Potential applications include speed and RPM sensing, brushless dc motor commutation, motor and fan control, magnetic encoding, disc speed, tape rotation, flow-rate sensing, lid and door closing detection, and position sensing.

### **SS41/SS51T Series.**

**Features:** Bipolar magnetics • Sinking output • High output current capability • Reverse polarity protection

**Benefits:** Built-in regulator provides enhanced operational stability over supply voltage range. Open-collector digital sinking output voltage easily interfaces with wide variety of electronic circuits. Internal circuitry prevents sensor damage in case supply voltage polarity is accidentally reversed. Potential applications include brushless dc motor commutation, motor and fan control, magnetic encoding, and tape rotation sensing.

### **SS421 Series.**

**Features:** Bipolar magnetics • Sinking output • Active high and active low

versions • Adjustable speed trip point with external resistor and capacitor • Temperature compensated

**Benefits:** Internal circuitry contains timer so that one or two pulses at slower repetition rate than set point do not produce unwanted output. Small amount of hysteresis built into output provides operation right at set point and does not result in chattering output. User-provided external resistor and capacitor combination selects speed trip point for particular application. Temperature compensated for consistent operation with low-cost magnets. Built-in timing circuit designed to simplify and reduce cost of PC board design. Potential applications include monitor fan or motor performance.

### **SS42R.**

**Features:** Hall effect • Bipolar latching magnetics • Sinking or sourcing outputs • High output current capability • Reverse polarity protection

**Benefits:** Hall-effect integrated circuit with pair of complementary push/pull outputs. Dual Hall-effect element offsets stress-induced noise and drift. Operate and release points laser trimmed to improve symmetry around zero. Internal circuitry prevents sensor damage if supply voltage polarity is accidentally reversed. Potential applications include conveyors, motor control, ignitions, power sensing, linear or rotary motion detection, and RPM sensing.

### **SS46.**

**Features:** Bipolar latching magnetics • Sinking (open collector) output • Negative compensation slope • High output current capability • High speed capability • Reverse polarity protection

**Benefits:** Internal circuitry prevents sensor damage in case supply voltage polarity is accidentally reversed. Open-collector sinking output voltage easily interfaces with wide variety of electronic circuits. Potential applications include speed and RPM sensing, brushless dc motor commutation, motor and fan control, magnetic encoding, disc speed, tape rotation, and flow-rate sensing.

## **VF526DT.**

**Features:** Frequency signal for speed output and logic level signal for direction output • Temperature-compensated magnetics and ultra-low offset drift • Wide operating voltage range • Miniature, SOT-89B plastic package • Tape and reel

**Benefits:** Two separate, built-in Hall sensors and associated logic circuitry provide a frequency signal for speed output and a logic level (high or low) signal for direction output, potentially replacing multiple sensors and electronic components. Temperature-compensated magnetics and ultra-low offset drift with temperature provide a stable output over a full temperature range of -40 °C to 125 °C [-40 °F to 257 °F]. Wide operating voltage range of 3.4 Vdc to 24 Vdc increases application flexibility. Tested to moisture sensitivity similar to JEDEC J-STD-020B, MSL Level 1, allowing use in environments where humidity may be a problem. Miniature plastic package supplied on tape and reel for automated assembly, allowing potential savings in PC board space and labor cost. Potential applications include anti-pinch electric motor control systems for power window and seats, magnetic encoding for electronic steering systems, motion control systems for pulleys and belts, garage door openers and sliding doors and position and velocity detection in industrial equipment.

## **HALL-EFFECT SENSOR ICS - LINEAR**

### **91SS Series.**

**Features:** Linear magnetics • Ratiometric sourcing output • Standard mounting centers • Linearity is  $\pm 1.5\%$  max. • Two package styles

**Benefits:** Hall-effect integrated circuit chip provides enhanced temperature stability and performance. Laser-trimmed, thick film resistors on ceramic substrate and thin film resistors on integrated circuit reduce null and gain shifts over temperature, resulting in consistent sensitivity between devices. Potential applications include robotics control, current sensing, linear or rotary motion detection, and length measurement.

## **SS490/SS491B Series.**

**Features:** Linear magnetics • Ratiometric sourcing output • Positive temperature coefficient • Different package styles

**Benefits:** Quad Hall elements design minimizes effects of mechanical or thermal stress on output and provides stable output. Laser-trimmed thin film resistors provide enhanced accuracy and temperature compensation to reduce null and gain shift over temperature. Positive temperature coefficient helps compensate for negative temperature coefficients of low cost magnets, providing robust design over wide temperature range. Rail-to-rail operation provides more useable signal for enhanced resolution. Potential applications include current sensing, motor control, position sensing, magnetic code reading, rotary encoding, liquid level sensing, vibration, and weight sensing applications.

## **SS39ET/SS49E/SS59ET Series.**

**Features:** Linear magnetics • Ratiometric sourcing output • Low-voltage operation • Small, through-hole and surface-mount packages • Available on tape and reel

**Benefits:** Thin film resistors provide enhanced temperature stability and accuracy. Low voltage operation for energy efficiency. Potential applications include current sensing, motor control, position sensing, magnetic code reading, ferrous metal detection, vibration, and liquid level sensing.

## **SS94 Series.**

**Features:** Linear magnetics • Ratiometric sourcing output • Standard mounting centers • Linearity is  $\pm 0.5\%$  max. • Two package styles

**Benefits:** Hall-effect integrated circuit chip provides enhanced temperature stability and performance. Laser-trimmed, thick film resistors on ceramic substrate and thin film resistors on integrated circuit reduce null and gain shifts over temperature, resulting in consistent sensitivity between devices. Includes low drift, high sensitivity, noise shielded, and general purpose listings. Potential applications include robotics control, current sensing, linear or rotary motion detection, and length measurement.

## **MAGNETORESISTIVE SENSOR ICS 2SS552M Series.**

**Features:** Omnipolar magnetics • Sinking output • Low gauss operation (25 G max.) • Operating speed of 0 kHz to over 100 kHz • Small, through-hole package • Tape and reel available

**Benefits:** Low gauss operation (25 G max.) extends sensing distance to one inch or more, depending on size. Potential polarity independent applications include presence/absence detection, lid sensor for laptop computers, position sensing for material handling equipment, and cylinder position sensing in pneumatic cylinders.

## **SS552MT.**

**Features:** Magnetoresistive • Omnipolar magnetics • Sinking output • Low gauss operation (25 G max.) • Operating speed of 0 kHz to over 100 kHz • Small, surface mount package • Tape and reel

**Benefits:** Low gauss operation (25 G max.) extends sensing distance to one inch or more, depending on size. Small, surface-mount package allows automated, lower-cost assembly. Potential polarity independent applications include presence/absence detection, lid sensor for laptop computers, position sensing for material handling equipment, and cylinder position sensing in pneumatic cylinders.

## **VF401.**

**Features:** 2-wire digital current output • Wide speed capability • One pulse per pole pair output and differential bridge operation • Output pattern independent of gap between target and sensor • Improved insensitivity to run-out, tilt and twist • Enhanced sensitivity • Reverse polarity protection • Miniature, TO-92-style plastic package

**Benefits:** High performance, digital, 2-wire, magnetoresistive sensor in a miniature, flat, TO-92-style plastic package with a current output designed for sensing fine pitch ring magnets. Wide speed capability provides application flexibility with true zero speed sensing and operation up to 3000 Hz. One pulse per pole pair output and differential bridge operation allow compatibility with

differential Hall sensors, making it easier to upgrade existing applications. Enhanced sensitivity,  $\pm 7$  Gauss typical allows for larger air gaps (up to 2,5 mm [0.098 in]) and higher pole density (up to 50-pole pairs depending on ring diameter).

Patented bridge array optimized to allow a greater air gap between the target and the sensor with reduced loss in sensor signal or accuracy. Potential applications include wheel speed sensing and shaft speed encoding using a multipole ring magnet in a wide variety of off road transportation, industrial and medical equipment.

#### **APS00B.**

**Features:** Dual bridges with outputs 45° out of phase • Wide, angular range • Low resolution capability • Absolute sensing

- Typical 0 MHz to 5 MHz frequency response
- Low power requirements
- Small, surface mount package (SO-8)
- Tape and reel

**Benefits:** Wide, angular range allows measurements of  $\pm 90^\circ$  without additional components; measurements of  $\pm 180^\circ$  are possible with external components. Dual Wheatstone bridges provide passive, low-noise design, enhancing system performance. Outputs 45° out of phase may be used as speed and direction signals. Resolution capability of less than 0.05° enhances overall system accuracy. Absolute sensing means no indexing is required and the exact target position is known, simplifying system design. Typical 0 MHz to 5 MHz frequency response with 190 G minimum magnetic field applied makes this saturated mode sensor suitable for potential high speed applications. Measures only field direction and is virtually unaffected by shock, vibration and magnetic-source gap variations for stable and reliable output. Small, surface-mount package saves room on PC board when compared to larger IC packages and components. Tape and reel configuration (two sizes available) allows use with automated pick-and-place equipment, potentially reducing assembly costs. Honeywell APS00A instrumentation amplifier available separately for additional signal processing. Potential applications include high-accuracy

angular position, speed and angle, and displacement sensing in a wide variety of off road transportation, medical and industrial equipment.

#### **VALUE-ADDED HALL-EFFECT SENSORS**

##### **103SR Series (Digital).**

**Features:** Unipolar, bipolar, bipolar latching magnetics • Sinking or sourcing output • Aluminum housing • Color-coded, jacketed cable • Adjustable mounting

**Benefits:** Rugged, threaded aluminum housing. Choice of cable materials provides application flexibility. Potential applications include position and RPM sensing in non-corrosive applications.

##### **103SR Series (Linear).**

**Features:** Linear magnetics • Ratiometric sinking/sourcing output • Aluminum housing • Color-coded, jacketed cable • Adjustable mounting

**Benefits:** Rugged, threaded aluminum housing. Choice of cable materials provides application flexibility. Potential applications include position and RPM sensing in non-corrosive applications.

##### **1GT Series.**

**Features:** Sinking output • Fast operating speed • Reverse polarity and transient protection • EMI resistant • Wide continuous operating temperature range

**Benefits:** Magnetically-biased, Hall-effect integrated circuit accurately senses movement of ferrous metal targets. Sealed in probe-style package for physical protection and cost-effective installation. Internal circuitry prevents sensor damage in case supply voltage polarity is accidentally reversed. Enhanced low speed performance, output amplitude not dependent on RPM. Sensor electronically self-adjusts to slight variations in runout and temperature, simplifying installation and maintenance. Potential applications include camshaft and crankshaft speed and position, transmission speed, and tachometer, as well as anti-skid and traction control.

#### **SR16/SR17 Series.**

**Features:** Sinking output • Non-contact position sensing • Compact, robust packages • Environmentally sealed package • Three terminations available

**Benefits:** Internal magnet and Hall-effect sensor mounted in dual tower or side mount configuration for application flexibility. Mechanically interchangeable with standard optical sensors. Medium level magnetic switching reduces stray field interference. No mechanical contacts often eliminates product wear. Environmentally sealed plastic package provides enhanced accuracy and repeatability in environments in which dirt, dust, or stray IR light might affect performance of optical solutions. Potential applications include position and speed sensing in fitness and information technology, as well as in moderate electrical, chemical, and mechanical environments.

#### **SR3 Series.**

**Features:** Unipolar, bipolar magnetics • Sinking output • Frequencies exceeding 100 kHz

**Benefits:** Plastic housing for position and RPM sensing in potential corrosive applications such as food and beverage, chemical plants, and refineries.

#### **SR4 Series.**

**Features:** Magnetoresistive • Omnipolar magnetics • Sinking output

**Benefits:** Magnetoresistive technology allows longer sensing distance at lower gauss than Hall effect. Plastic housing for position and RPM sensing in potential corrosive applications such as food and beverage, chemical plants, and refineries.

#### **SPEED AND DIRECTION SENSORS**

##### **1GT Series.**

**Features:** Enhanced operating speed • Reverse polarity and transient protection • EMI resistant • Wide continuous operating temperature range • Probe-style package • Enhanced low speed performance • Output amplitude not dependent on RPM

**Benefits:** Sealed in probe-style package for physical protection and cost-effective installation. Sensor electronically self-adjusts to slight variations in runout and

temperature, simplifying installation and maintenance. Circuit senses movement of targets in potential applications such as camshaft and crankshaft speed and position, transmission speed, and tachometer, as well as anti-skid and traction control.

### **LCZ Series.**

**Features:** Stainless steel package • Low cost • Omni-directional sensor to target orientation • Low power consumption • Small size • Zero speed • Digital output • Durable, cost-effective sensing solution • Screw-in package style

**Benefits:** Available in several diameters and lengths for application flexibility. Stainless steel package simple to install/adjust and does not require rotational orientation. Potential applications include harsh environment rotary applications such as pumps, rollers, mixers, fan speed measurement, transmission, spindles, gear reducer RPM, synchronization, compressor speed, and dyno testing, as well as industrial process control and factory automation.

### **SNDH-T Series.**

**Features:** Advanced performance dynamic offset self calibration • Short circuit and reverse voltage protection • Air gap up to 2 mm [0.08 in] • Low jitter output • Near-zero speed • EMI hardened • High frequency switching capability • Multiple connector options includes wire harness and integral connector versions using AMP super seal or AMP Jr. • Probe-style package • Integrated circuit packaging provides output phase shift tolerancing with enhanced accuracy

**Benefits:** Provides speed and direction information using quadrature output with signals 90 degree phase shifted from each other. BiCMOS Hall-effect technology, using advanced digital signal processing for dynamic off-set cancellation, provides enhanced air gap performance and phase shift accuracy over most conditions. Package design includes O-ring seal for potential pressure applications and a fixed mounting flange. Robust, automotive under-the-hood grade packaging for most environmental conditions as well as EMI hardened. Used in potential applications

where high resolution is required at wide frequency ranges and large air gaps.

### **SNDH-H Series.**

**Features:** Hall-effect magnetic sensing technology • Digital current sinking output (open collector) • Advanced performance dynamic offset self-calibration • Air gap up to 2,5 mm [0.098 in] • Zero speed versions • High frequency switching capability (0 Hz to 15 kHz) • -40 °C to 150 °C [-40 °F to 302 °F] operating temperature capability • Multiple connector options • O-ring seal

**Benefits:** Use a magnetically biased Hall-effect integrated circuit to accurately sense movement of ferrous metal targets. The specially designed IC (integrated circuit) and a permanent magnet are sealed in rugged, probe-type packages. The flux density of the permanent magnet alters when approached by ferrous metal and is detected by the Hall ICs. If the sensor is positioned at the circumference of a revolving gear wheel, for example, it detects the teeth and tooth spaces, supplying a digital pulse output with frequency proportional to gear wheel speed. Potential applications include tachometers/counters, speed of gears and shafts in transmissions, hydraulic motors, pumps, and gear boxes flow meters/turbines, and engine RPM.

### **ZH10.**

**Features:** Aluminum package • Low cost • Omni-directional sensor to target orientation • Low power consumption • Small size • Zero speed • Digital output • Durable, cost-effective sensing solution • Screw-in package style

**Benefits:** Aluminum package simple to install/adjust and does not require rotational orientation. Potential applications include harsh environment rotary applications such as pumps, rollers, mixers, fan speed measurement, transmission, spindles, gear reducer RPM, synchronization, compressor speed, and dyno testing, as well as industrial process control and factory automation.

### **GTN Series.**

**Features:** Choice of barrel lengths • Integrated electronic diagnostics

• Enhanced operating speed • EMI resistant • Reverse polarity and transient protection • Wide continuous operating temperature range • Probe-style package • Enhanced low speed performance • Output amplitude not dependent on RPM

**Benefits:** Sealed in probe-style package for physical protection and cost-effective installation. Sensor electronically self-adjusts to slight variations in runout and temperature, simplifying installation and maintenance. Integrated electronic diagnostics detect open or short circuits in power supply line by monitoring sensor output. Circuit senses movement of ferrous metal targets in potential applications such as camshaft and crankshaft speed and position, transmission speed, and tachometer, as well as anti-skid and traction control.

### **SNDJ Series.**

**Features:** Three housing styles • Three different outputs • Direct sensing of ferrous metal target • Zero speed sensing capabilities (some listings) • Stainless steel housing • Probe and screw-in package styles • Rotational orientation independent of sensor function

**Benefits:** Used with ferromagnetic gears or pole wheel to generate impulse frequencies proportional to target speed. Rugged stainless steel housing for potential applications found in high speed gear tooth sensing, over-speed detection, and rotary gear or shaft position detection.

## **VARIABLE RELUCTANCE SPEED SENSORS**

**VRS General Purpose Series, VRS Hazardous Location Series, VRS High Output Series, VRS High Resolution Series, VRS High Temperature Series, VRS Power Output Series.**

**Features:** Self-powered operation • Simple installation • No moving parts • Operates over wide speed range • Adaptable to wide variety of configurations • Customized versions for potential unique speed sensing applications

**Benefits:** All: Direct conversion of actuator speed to output frequency. VRS General Purpose Series, VRS Hazardous Location Series: Simple, rugged devices do not require external voltage source for operation. VRS High Output Series: Performs best at low to medium speeds with medium to high impedance loads. Sealed front-end versions available for use where sensor is exposed to fluids, lubricants, or adverse environmental conditions. VRS High Resolution Series: Proper sensor alignment is required. VRS High Temperature Series: Sealed front-end versions for potential applications where sensor is exposed to fluids, lubricants, or adverse environmental conditions.

**Potential applications:** VRS General Purpose Series: Engine and motor RPM, process, flow, wheel-slip, and gear speed measurement with medium to high speeds or in electrically noisy environments with relatively small air gaps. VRS Hazardous Location Series: Engine and motor RPM, process, flow, wheel-slip, and gear speed measurement where explosion-proof or intrinsically safe sensors are required. VRS High Output Series: Engine and motor RPM, process, flow, wheel-slip, and gear speed measurement where higher output voltages are needed. VRS High Resolution Series: Engine and motor RPM, process, flow, wheel-slip, and gear speed measurement where precise timing pulse is required, and/or fine pitch gears are used. VRS High Temperature Series: Engine and motor RPM, process, flow, wheel-slip, and gear speed measurement where sensor is exposed to temperatures up to 260 °C [450 °F]. VRS Power Output Series: Driving low resistance loads at large air gaps in engine and motor RPM, process, flow, wheel-slip, and gear speed measurement where larger actuators may be used.

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