

# Magnetic Sensors Line Guide



You know us as a leader, whether you've known us as MICRO SWITCH or Honeywell Sensing and Internet of Things (SIoT). 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 SIoT 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 uA 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-89B) 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-89B) 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

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## Precision. Repeatability. Ruggedness.

Each Honeywell SLoT 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.

**Magneto-resistive sensor ICs** have a built-in magneto-resistive 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.

**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 style (packaging)</b>	SOT-23 (pocket tape and reel)
<b>Supply voltage range</b>	2.2 Vdc to 5.5 Vdc
<b>Supply current</b>	SL353LT: 1.8 uA 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

### SS311PT, SS411P

<b>Description</b>	low-cost bipolar digital Hall-effect sensor IC	bipolar digital Hall-effect sensor ICs with built-in pull-up resistor
<b>Magnetic actuation type</b>	bipolar	bipolar
<b>Package style (packaging)</b>	<b>SS30AT:</b> SOT-23 (pocket tape and reel) <b>SS40A:</b> flat TO-92-style, standard straight leads (bulk) <b>SS50AT:</b> SOT-89B (pocket tape and reel)	<b>SS311PT:</b> SOT-23 (pocket tape and reel) <b>SS411P:</b> flat TO-92-style, standard straight leads (bulk)
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	2.7 Vdc to 7 Vdc
<b>Supply current</b>	10 mA max.	14 mA max.
<b>Output type</b>	digital sinking	digital sinking
<b>Operating temperature range</b>	<b>SS40A:</b> -40°C to 125°C [-40°F to 257°F] <b>SS30AT, SS50AT:</b> -40°C to 125°C [-40°F to 257°F]	-40°C to 150°C [-40°F to 302°F]



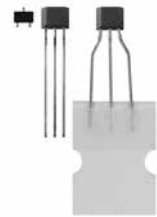
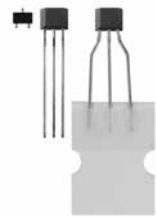
## Hall-effect sensor ICs – digital

### SS340RT, SS440R Series

### SS345PT, SS445P

### SS351AT, SS451A, SS551AT

<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>	<b>SS340RT:</b> North pole <b>SS440R:</b> South pole	unipolar	omnipolar
<b>Package style (packaging)</b>	<b>SS340RT:</b> SOT-23 (pocket tape and reel) <b>SS440R:</b> flat TO-92-style, standard straight leads (bulk)	<b>SS345PT:</b> SOT-23 (pocket tape and reel) <b>SS445P:</b> flat TO-92-style, standard straight leads (bulk)	<b>SS351AT:</b> SOT-23 (pocket tape and reel) <b>SS451A:</b> flat TO-92-style, standard straight leads (bulk) <b>SS551AT:</b> SOT-89B (pocket tape and reel)
<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>	<b>SS340RT</b> (3 Vdc to 24 Vdc): -40°C to 125°C [-40°F to 257°F] <b>SS340RT</b> (3 Vdc to 12 Vdc): -40°C to 150°C [-40°C to 302°F] <b>SS440R</b> (3 Vdc to 24 Vdc): -40°C to 150°C [-40°F to 302°F]	-40°C to 150°C [-40°F to 302°F]	<b>SS351AT</b> (3 Vdc to 24 Vdc): -40°C to 125°C [-40°F to 257°F] <b>SS351AT</b> (3 Vdc to 12 Vdc): -40°C to 150°C [-40°C to 302°F] <b>SS451A, SS551AT</b> (3 Vdc to 24 Vdc): -40°C to 150°C [-40°F to 302°F]



## Hall-effect sensor ICs – digital

### SS360NT, SS360ST, SS360ST-10K, SS460S, SS460S-T2

### SS360PT, SS460P, SS460P-T2

### SS361CT, SS461C

<b>Description</b>	high sensitivity latching Hall-effect digital sensor IC	high sensitivity latching Hall-effect digital sensor IC with built-in pull-up resistor	high sensitivity latching Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	latching	latching	latching
<b>Package style (packaging)</b>	<b>SS360NT, SS360ST, SS360ST-10K:</b> SOT-23 (pocket tape and reel) <b>SS460S:</b> flat TO-92-style, standard straight leads (bulk) <b>SS460S-T2:</b> flat TO-92-style, formed leads; (ammopack tape-in-box) SS460-LP:	<b>SS360PT:</b> SOT-23 (pocket tape and reel) <b>SS460P:</b> flat TO-92-style, standard straight leads (bulk) <b>SS460P-T2:</b> flat TO-92-style, formed leads (ammopack tape-in-box)	<b>SS361CT:</b> SOT-23 (pocket tape and reel) <b>SS461C:</b> flat TO-92-style, standard straight leads (bulk)
<b>Supply voltage range</b>	3 Vdc to 24 Vdc	3 Vdc to 24 Vdc	4 Vdc to 24 Vdc
<b>Supply current</b>	8 mA max.	10 mA max.	6 mA max.
<b>Output type</b>	digital	digital	digital sinking
<b>Operating temp. range</b>	-40°C to 125°C [-40°F to 257°F]	-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**

**VF360NT, VF360ST, VF460S**

**SS400, SS500 Series**

<b>Description</b>	latching Hall-effect digital sensor IC	high sensitivity latching digital Hall-effect sensor IC	<b>SS400:</b> unipolar/bipolar/latching Hall-effect digital sensor IC <b>SS500:</b> unipolar/bipolar/latching Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	latching	latching	unipolar, bipolar, latching
<b>Package style (packaging)</b>	<b>SS361RT:</b> SOT-23 (pocket tape and reel) <b>SS461R:</b> flat TO-92-style, standard straight leads (bulk)	<b>VF360NT, VF360ST:</b> SOT-23 (pocket tape and reel) <b>VF460S:</b> flat TO-92-style, standard straight leads (bulk)	<b>SS400:</b> flat TO-92-style, standard straight leads (bulk) <b>SS500:</b> SOT-89B (pocket tape and reel)
<b>Supply voltage range</b>	3 Vdc to 18 Vdc, except SS361RT >125°C [257°F]: 3 Vdc to 12 Vdc	3 Vdc to 24 Vdc	3.8 Vdc to 30 Vdc (inclusive)
<b>Supply current</b>	8 mA	8 mA max.	<b>SS400:</b> 10 mA <b>SS500:</b> 8.7 mA at 5 Vdc
<b>Output type</b>	digital sinking	digital sinking	digital sinking
<b>Operating temperature range</b>	<b>SS361RT</b> (3 V to 12 V), <b>SS461R:</b> 40°C to 150°C [-40°F to 302°F] <b>SS361RT</b> (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]	-40°C to 150°C [-40°F to 302°F]

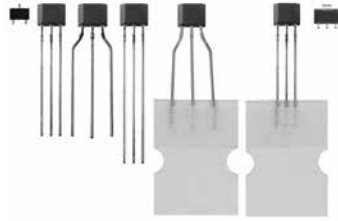


## Hall-effect sensor ICs – digital

**SS41, SS51T**

**VF526DT**

<b>Description</b>	bipolar Hall-effect digital sensor IC	latching dual Hall-effect digital sensor IC with speed and direction outputs
<b>Magnetic actuation type</b>	bipolar	latching
<b>Package style (packaging)</b>	<b>SS41:</b> flat TO-92-style, standard straight leads (bulk) <b>SS51T:</b> SOT-89B (pocket tape and reel)	SOT-89B (pocket tape and reel)
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	3.4 Vdc to 24 Vdc
<b>Supply current</b>	15 mA max.	Off: 12 mA max. On: 14 mA max.
<b>Output type</b>	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 125°C [-40°F to 257°F]



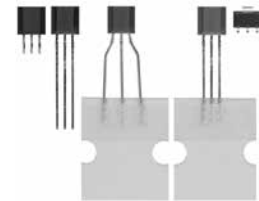
## Hall-effect sensor ICs – linear

**SS39ET, SS49E, SS49E-F, SS49E-L, SS49E-T2, SS49E-T3, SS59ET**

**SS490, SS491B Series**

<b>Description</b>	Hall-effect linear sensor IC	Hall-effect linear sensor IC
<b>Magnetic actuation type</b>	linear	linear
<b>Package style (packaging)</b>	<p><b>SS39ET:</b> SOT-23 (pocket tape and reel)  <b>SS49E:</b> flat TO-92-style, standard straight leads (bulk)  <b>SS49E-F:</b> flat TO-92-style, formed leads (bulk)  <b>SS49E-L:</b> flat TO-92-style, long straight leads (bulk)  <b>SS49E-T2:</b> flat TO-92-style, formed leads (ammopack tape-in-box)  <b>SS49E-T3:</b> flat TO-92-style, standard straight leads (ammopack tape-in-box)  <b>SS59ET:</b> SOT-89B (pocket tape and reel)</p>	flat TO-92-style, standard straight leads (bulk)
<b>Supply voltage range</b>	2.7 Vdc to 6.5 Vdc	4.5 Vdc to 10.5 Vdc
<b>Supply current</b>	10 mA max.	10 mA
<b>Output type</b>	ratiometric sourcing	ratiometric sinking or sourcing
<b>Operating temperature range</b>	-40°C to 100°C [-40°F to 212°F]	-40°C to 150°C [-40°F to 302°F]

## Magneto-resistive sensor ICs






**Nanopower Series**



**Standard Power Series**

**2SS52M Series**

<b>Description</b>	omnipolar magneto-resistive sensor IC	omnipolar magneto-resistive sensor IC	omnipolar magneto-resistive digital sensor IC
<b>Magnetic actuation type</b>	omnipolar	omnipolar	omnipolar
<b>Package style (packaging)</b>	SOT-23 (pocket tape and reel)	<p><b>SM351RT, SM353RT:</b> SOT-23 (pocket tape and reel)  <b>SM451RT, SM453RT:</b> flat TO-92-style, standard straight leads (bulk)</p>	U-pack, straight leads (bulk)
<b>Supply voltage range</b>	1.65 Vdc to 5.5 Vdc	3 Vdc to 24 Vdc	3.8 Vdc to 30 Vdc
<b>Supply current</b>	<p><b>SM351LT:</b> 360 nA typ.  <b>SM353LT:</b> 310 nA typ.</p>	8 mA max.	1.1 mA max.
<b>Output type</b>	low: 0.03 V typ. high: $V_s - 0.03$ V typ.	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]	-40°C to 150°C [-40°F to 302°F]

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Magnetoresistive sensor ICs			
	<b>SS552MT Series</b>	<b>VF401</b>	<b>APS00B</b>
<b>Description</b>	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	differential bridge	analog, saturated mode
<b>Package style</b>	SOT-89B (pocket tape and reel)	flat TO-92-style, standard straight leads (bulk)	SOIC-8 (pocket tape and reel)
<b>Supply voltage range</b>	3.8 Vdc to 30 Vdc	4.5 Vdc to 16 Vdc	1 Vdc to 12 Vdc
<b>Supply current</b>	11 mA max.	operate: 16.8 mA max. release: 8.4 mA max.	7 mA max.
<b>Output type</b>	digital sinking	digital sourcing	dual analog voltages responding to changes in magnetic field angle
<b>Operating temp. 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 150°C [-40°F to 302°F]

Value-added Hall-effect sensors		
	<b>103SR Series (Digital)</b>	<b>103SR Series (Linear)</b>
<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, latching	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



**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]

## Value-added Hall-effect sensors



**SR16/SR17 Series**

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



### Active speed sensors

#### SNG-Q Series

#### SNDH-T Series

<b>Description</b>	Hall-effect speed and direction sensor with quadrature output	Hall-effect speed and direction sensor with quadrature output
<b>Housing material</b>	PBT	stainless steel and plastic
<b>Housing length</b>	45 mm [1.77 in], 35 mm [1.38 in]	35 mm [1.38 in]
<b>Supply voltage range</b>	4.5 V to 26 V	4.5 Vdc to 18 Vdc
<b>Supply current</b>	2 mA normal, 18 mA max.	18 mA max.
<b>Output type</b>	square wave	square wave
<b>Operating frequency range</b>	3 Hz to 20 kHz	1 Hz to 15 kHz
<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]



### Active speed sensors

#### SNDH-H Series

#### LCZ Series

#### ZH10 Series

<b>Description</b>	Hall-effect speed sensor	Hall-effect zero speed sensor	Hall-effect zero speed sensor
<b>Housing material</b>	stainless steel or plastic	stainless steel	aluminum
<b>Supply voltage range</b>	4 Vdc to 24 Vdc (inclusive)	4.5 Vdc to 26 Vdc	4 Vdc to 24 Vdc
<b>Supply current</b>	20 mA max.	20 mA	6 mA
<b>Output type</b>	digital sinking	digital sinking	digital sinking
<b>Operating frequency range</b>	0 Hz to 15 kHz, 2 Hz to 15 kHz	0 Hz to 15 kHz	0 Hz to 15 kHz
<b>Operating temperature range</b>	-40°C to 150°C [-40°F to 302°F]	40°C to 125°C [-40°F to 257°F]	-40°C to 125°C [-40°F to 257°F]



### Digital magnetic speed sensors

#### 584XX Series

<b>Description</b>	digital magnetic speed sensor
<b>Housing material</b>	stainless steel
<b>Supply voltage range</b>	5 Vdc to 30 Vdc
<b>Supply current</b>	15 mA
<b>Output type</b>	square wave
<b>Operating frequency range</b>	-
<b>Operating temperature range</b>	-40°C to 107°C [-40°F to 225°F]





## Passive 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)



## Passive 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]



## Passive 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]

system cost. 2.7 Vdc to 7 Vdc supply voltage range allows use in low voltage applications, promoting energy efficiency. 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 flat TO-92-style or SOT-89B, 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, SS551AT.**

**Features:** Omnipolar magnetics • Small through-hole and surface mount (SOT-23 and SOT-89B) packages • 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 three package styles: SS351AT in the subminiature SOT-23 surface mount; the SS551AT in the SOT-89B surface mount, and 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, SS360ST-10K, SS460S, SS460S-T2.**

**Features:** Fastest response time in its class • No chopper stabilization • High sensitivity • Latching magnetics • Sub-miniature, SOT-23 surface mount package (SS360NT, SS360ST, SS360ST-10K) supplied on tape and reel • Small, leaded, flat TO-92-style package (SS460S, SS460St-T2) • Wide operating voltage range of 3 Vdc to 24 Vdc • Built-in reverse voltage • Durable design • RoHS-compliant material

**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. 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.

#### **SS360PT, SS460P, SS460P-T2.**

**Features:** Fastest response time in its class • No chopper stabilization • High sensitivity • Internal pull-up Hall IC design • Latching magnetics • Subminiature package size with tape and reel packaging • Small, flat TO-92-style package • Wide operating voltage range of 3 Vdc to 24 Vdc • Built-in reverse voltage capability • Robust design • RoHS-compliant meets directive 2002/95

**Benefits:** Fastest response time in its class provides more efficiency in commutating a brushless dc motor. 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 125°C [-40°F to 257°F] temperature range, allowing for the use of smaller, magnets or a wider air gap. Internal pull-up Hall IC design simplifies installation and helps reduce component count and system cost. Latching magnetics make these products well-suited for accurate speed sensing and RPM (revolutions per minute) measurement. Sub-miniature, SOT-23 surface mount package (SS360PT) supplied on tape and reel allows for compact design with automated component placement. Small, leaded, flat TO-92-style package (SS460P) allows for a compact PC board layout. Wide operating voltage range allows for potential use in a wide range of applications. Built-in reverse voltage capability enhances the protection

of the sensor and the circuits. Robust design allows operation up to 125°C [257°F]. Potential industrial/commercial applications include brushless dc motor commutation for white goods and other appliances, flow rate sensing, speed and RPM sensing, tachometer and counter pickup, and motor and fan control.

#### **SS361CT, SS461C.**

**Features:** Enhanced sensitivity • 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. 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:** 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.

#### **VF360NT, VF360ST, VF460S.**

**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

**Benefits:** May be used in potential transportation applications such as 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), and flow rate sensing

#### **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.

#### **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**

##### **SS39ET, SS49E, SS49E-F, SS49E-L, SS49E-T2, SS49E-T3, SS59ET.**

**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.

##### **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 usable 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.

#### **MAGNETORESISTIVE SENSOR ICS**

##### **Nanopower Series.**

**Features:** High sensitivity • Nanopower • Supply voltage range of 1.65 Vdc to 5.5 Vdc • Omnipolar sensing • Temperature range of -40°C to 85°C [-40 to 185°F] • Push-pull (CMOS) output • Non-chopper stabilized design • RoHS-compliant materials • Subminiature SOT-23 package

**Benefits:** High sensitivity of 7 Gauss typ., 11 Gauss max. (SM351LT); 14 G typ., 20 Gauss max. (SM353LT) suitable for a wide range of applications with large air gaps, small magnetic fields and low power requirements. Average current of 360 nA typ. (SM351LT) and 310 nA typ. (SM353LT) allows for use in battery operated equipment. Responds to either a North or South Pole, eliminating the need for the magnet polarity to be identified. Push-pull output eliminates the need for external resistors and helps reduce production costs. Non-chopper stabilized design eliminates external noise generated by the sensor. SOT-23 package on tape and reel (3000 units per reel). Designed for potential use in a wide range of battery-operated applications including water and gas meters, electricity meters, industrial smoke detectors, exercise equipment, security systems, hand-held computers and scanners; white goods such as dishwashers, microwaves, washing machines, refrigerators and coffee

machines; medical equipment such as hospital beds, medication dispensing cabinets, infusion pumps; consumer electronics such as notebook computers, tablets, and cordless speakers.

#### **Standard Power Series.**

**Features:** High sensitivity: 7 Gauss typ., 11 Gauss max. (SM351RT and SM451R); 14 Gauss typ., 20 Gauss max. (SM353RT and SM453R) • Supply voltage range of 3 Vdc to 24 Vdc simplifies design-in • Omnipolar sensing • Temperature range of -40°C to 85°C [-40°F to 185°F] • RoHS-compliant materials: Meets Directive 2002/95/EC • SOT-23 or flat TO-92-style package

**Benefits:** Ultra-sensitive devices designed for manufacturers who need a durable and reliable speed or position sensor for large air gaps or small magnetic fields in standard power (3 Vdc to 24 Vdc) applications. Respond to either North or South pole applied in direction parallel to sensor; do not require magnet polarity to be identified, simplifying installation and potentially reducing system cost. SOT-23 and flat TO-92-style packages, as well as two magnetic sensitivities, accommodate variety of application needs. SOT-23 surface mount package supplied on tape and reel (3000 units per reel) for use in automated pick-and-place component installation. Potential industrial applications include high frequency flow sensing in HVAC, water, fuel, and gas utility meters; anti-tamper detection in water, electric, and gas utility meters; liquid level detection, motor RPM sensing, and in-cylinder position sensing. Potential medical applications include RPM sensing and magnetic interrupt in exercise and rehabilitation equipment, absence/presence detection in infusion pumps, position sensing of medication dispensing cabinet drawers, and incline position sensing in hospital beds. Potential white goods applications include lid, door and drawer position detection, fluid flow detection, and liquid level detection.

#### **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 8-pin SOIC package on 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  $0.05^\circ$  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, 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.

### 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.

### 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.

## ACTIVE SPEED SENSORS

### SNG-Q Series.

**Features:** Wide operating temperature range: -40 °C to 150 °C [-40°F to 302°F]

- Environmental sealing: Moisture ingress protection rated to IP69K
- Robust electrical noise immunity: Electrical noise radiated immunity (EMC) rated to 100 V/m
- High frequency switching capability: 3 Hz to 20 kHz
- Direction information from phase-shifted dual output signals
- O-ring seal: Enables environmental sealing to mounting surface
- Supply voltage range: 4.5 V to 26 V
- CE certified

**Benefits:** Design and manufacturing use platform-based approach that enables cost-competitiveness and mechanical and electrical configurability. Provides both speed and direction information: speed from digital square wave outputs; direction using a quadrature output with signals 90° phase shifted from each other, target direction determined by output lead/lag phase shifting. Designed for applications where enhanced accuracy is required to detect small target features. Enhanced accuracy enabled by dual differential Hall-effect sensor IC technology. Designed for wide operating temperature range, robust electrical noise immunity and environmental sealing capability.

Potential industrial applications include power control in heavy duty vehicle ac induction motors and speed and position control in escalators and elevators. Potential transportation applications include power regulation control of hybrid electric transmissions and engines in heavy duty vehicles, and wheel speed detection in material handling, agriculture and construction machines.

### 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 including 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 offset cancellation, designed to provide enhanced air gap performance and phase shift accuracy over most conditions. Package design includes O-ring seal for pressure applications and a fixed mounting flange. Robust, automotive under-the-hood grade packaging for most environmental conditions as well as EMI hardened. Designed for potential applications where extremely high resolution is required at wide frequency ranges, and large air gaps.

### 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-style package

**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, plus industrial process control and factory automation.

### **ZH10 Series.**

**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-style package

**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, plus industrial process control and factory automation.

### **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 uniquely 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.

## **DIGITAL MAGNETIC SPEED SENSORS**

### **584XX Series.**

**Features:** Senses moving ferrous metal • Output signal of integrated circuit allows for direct use in digital equipment • Eliminates the need for interface circuitry, often reducing installation and maintenance costs • Enhanced stability due to precisely-matched components • Extremely precise relationship between the physical position of any sensed object and the electrical signal produced provides improved accuracy to timing and positioning applications • Enhanced sensitivity

**Benefits:** Enhanced resistance to water, oil, shock and vibration damage extends the product life and operating reliability. A variety of supply voltages and pre-leaded or connector versions allow flexibility of use in the application. Allows for the reduction in noise, often vital in potential positioning and synchronization applications. Standard thread sizes enhance compatibility and interchangeability with other standard types of speed sensors. Potential applications include computing, high-speed counting, positioning, tachometry, synchronization, routing, flow metering, machine control, engine, motor, or pump RPM sensing, over/under speed sensing, and wheel speed detection.

## **PASSIVE SPEED SENSORS (Variable Resistance Sensors - VRS)**

**General Purpose Series, Hazardous Location Series, High Output Series, High Resolution Series, High Temperature Series, 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 series: 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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