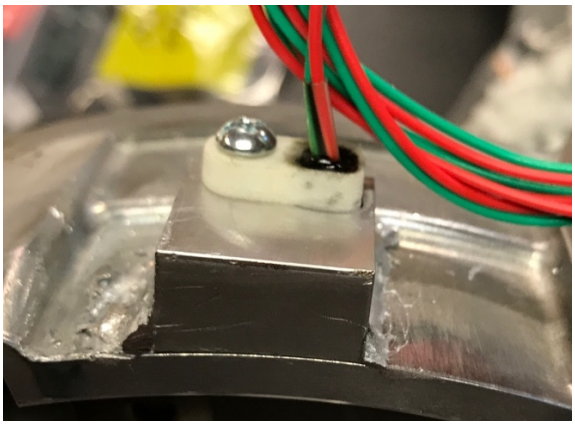
Intermediate – Speed Sensor

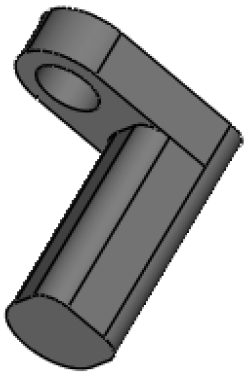
Description

This sensor uses a Back Biased differential Hall Effect device to measure the passing teeth of a ferrous target. The sensor face must be oriented such that, the bolt hole is in line with the direction of rotation.
The device uses an industry standard 2 level current output (nominals: 7mA and 14mA).



Features and Benefits

- Senses motion of a ferrous object, no additional magnet(s) need to be added
- 2-wire Current output
- Extremely small size (Body: w:8.5mm x L:20mm)
- Very Immune to EMC
- True Zero Speed
- AGC (Automatic Gain Control)
- AOA (Automatic Offset Adjust)
- Under voltage Lockout



Absolute Maximum Ratings

Characteristics	Symbol	Notes	Rating	Units
Forward Supply Voltage	Vcc		28	V
Reverse-Supply Voltage	Vrcc		-18	V
Operating Ambient Temp	Ta		-40 to 150	C

Electrical Characteristics

Characteristics	Symbol	Test Condition	Min	Typ	Max.	Units
Supply Voltage	Vcc	T<=150C	4.0	-	24	V
Undervoltage Lockout	Vcc(uv)	Vcc, 0-5 or 5-0	-	3.6	3.95	V
Reverse Supply Current	Ircc	Vcc = Vrcc(max)	-	-	-10	mA

Supply Zener Clamp Voltage	Vzs	Icc = Icc_max + 3mA, Ta=25C	28	-	-	V
Supply Zener Current	Icc	Ta=25C, Vcc=28V	-	-	19	mA
Chopping frequency	Fc	Ta =25C	-	400	-	kHz
Bypass Capacitance		Vcc to GND	-	2200	-	pF

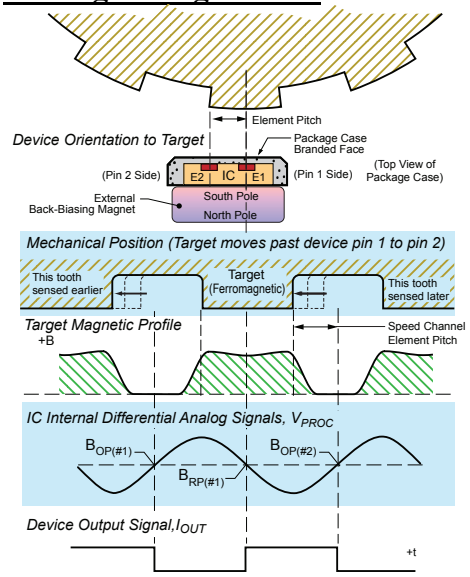
Output Characteristics

Characteristics	Symbol	Test Condition	Min	Typ	Max.	Units
Power-on State	POS	-H	-	Icc(High)	-	-
		-L	-	Icc(Low)	-	-
Supply Current	Icc(low)	Low-Current State	5.9	-	8.4	mA
	Icc(High)	High-current state	12	-	16	mA
Supply Current Ratio	Icc(High)/Icc (Low)	Measured as a ratio of High current to low current	1.9	-	-	-
Output Rise time	Tr	Output slew rate, Rl=100Ω	0	-	1.5	uS
Output Fall time	Tf	Output slew rate, Rl=100Ω	0	-	1.5	uS

Operating Characteristics

Characteristics	Symbol	Test Condition	Min	Typ	Max.	Units
Operate Point	Bop	% of Pk-Pk, normalized internal signal	-	60	-	%
Release Point	Brp	% of Pk-Pk, normalized internal signal	-	40	-	%
Operating Frequency	F_fwd		0	-	5	kHz
Max Sudden Signal Amplitude Change	B(n+1)/B(n)	Adjacent Peak to Peak change	-	0.6	-	-
Front End Chopping Frequency			-	400	-	kHz

Sensing Configuration:



Output based on Target Rotation Direction:

Basically, as the gear rotates across the face of the H version of the IC from pin-1 to pin-2, the output starts high (see chart below) and then transitions low. More readily understood as High Over Tooth (HOT). Unfortunately, we only had the H version in stock and our gear rotates from pin-2 to pin-1 producing a Low Over Tooth output (LOT).

Due to mechanical constraints, the orientation of the Hall IC to the clock wise rotation has to be pin-2 to pin-1 therefore in the future the more appropriate version of the IC to use would be the L version. Which is opposite in polarity which would give us the desired but not mandatory HOT condition.

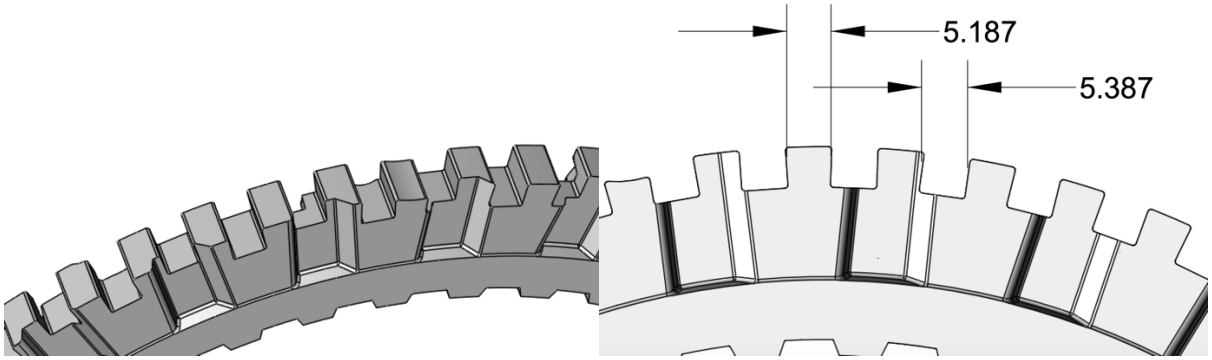
Table 1: Output Polarity when a South Pole Passes the Package Face in the Indicated Rotation Direction

Rotation Direction	Part Type	
	A1688LUBxx-H-x	A1688LUBxx-L-x
Pin 1 → Pin 2	$I_{CC(HIGH)}$	$I_{CC(LOW)}$
Pin 2 → Pin 1	$I_{CC(LOW)}$	$I_{CC(HIGH)}$

Note: Switching actually occurs over mid tooth or valley with this IC.

Target Geometry:

A 60-tooth target was is suggested for use. Both the teeth and valleys need to be near **5.0mm wide**. They should also be ~5mm deep.



Pin-out

Red = Vcc
White = Vout

Circuit Example:

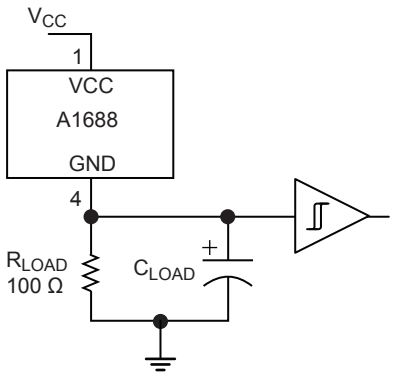


Figure 1: Typical Application Circuit