**Roush-Speed Sensor - Preliminary**

## Wheel 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 perpendicular 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
- Short and Long housing versions
- Very Immune to EMC
- True Zero Speed
- AGC (Automatic Gain Control)
- AOA (Automatic Offset Adjust)
- Under voltage Lockout



Rotation of gear teeth
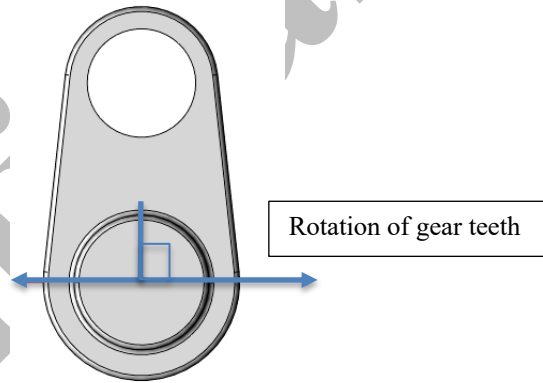
## Absolute Maximum Ratings

| 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 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 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 | - | - |
| Sudden air-gap distance | $\partial d$ | Nominal tooth to tooth air-gap change allowable | - | 0.8 | - | mm |
| Front End Chopping Frequency | | | - | 400 | - | kHz |
| Max air-gap Mechanical | a-g | Max achievable start-up (Distance from housing face to target tooth) | - | - | 3.0 | mm |

## Sensing Configuration:
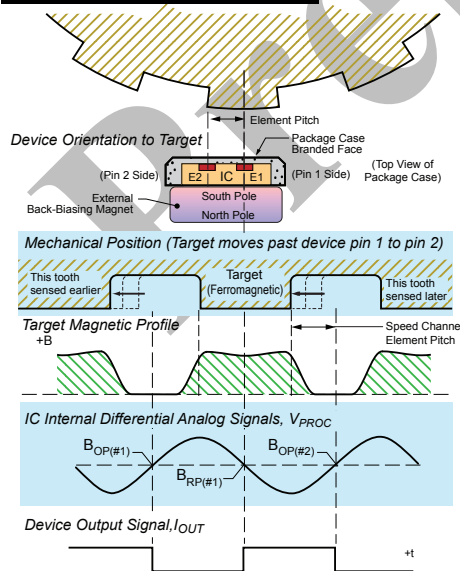
## Output based on Target Rotation Direction:

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). When looking at the bottom (sensing face of the sensor) with the tab pointing up, you will get high over tooth with a rotation from right to left.

<u>Note</u>: Switching actually occurs over mid tooth or valley with this IC.



Rotation direction for High Over tooth
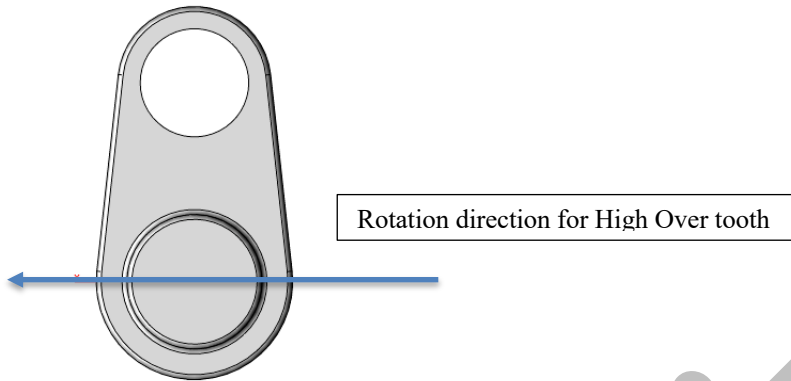
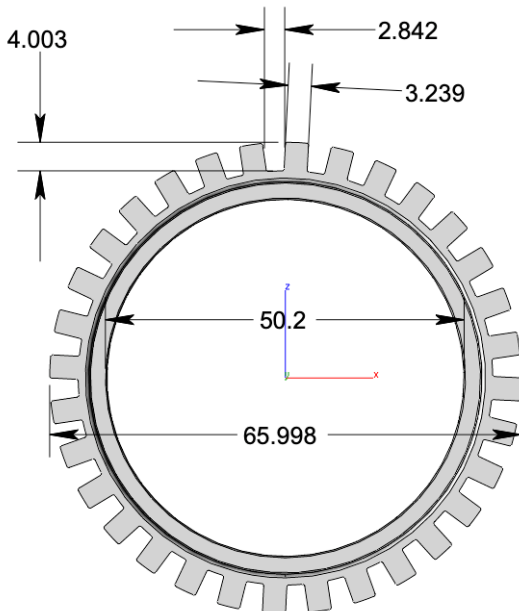Bottom view (sensing face)

## Target Geometry:

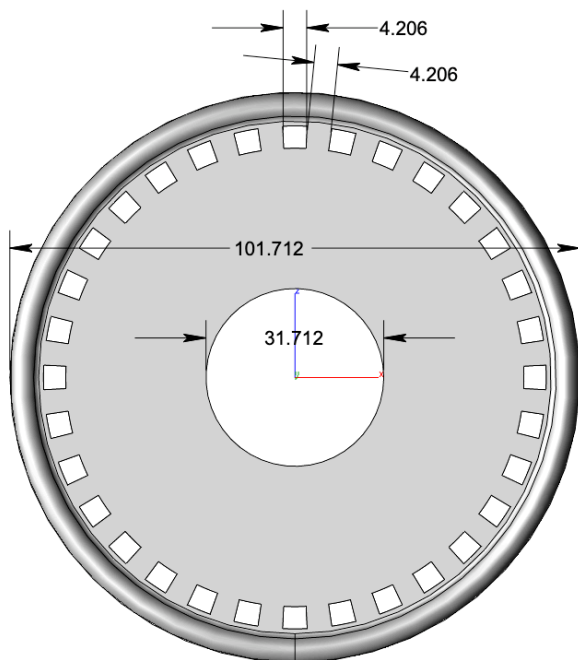A 32-tooth target was is suggested for use. Both the teeth and valleys need to be nominally **4.32mm wide**.

Maximum X misalignment +/-10mm
Maximum Y misalignment +/-2.0mm

## Front/Radial Target:

## Rear/Axial Target



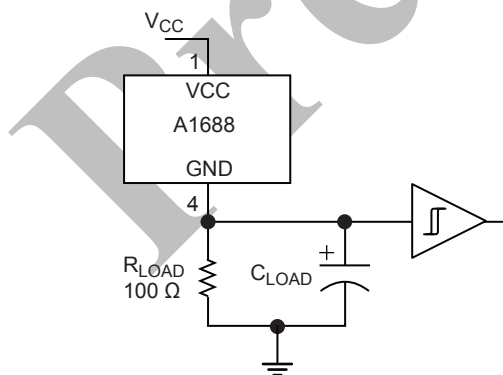## Pin-out

Red = Vcc (Slot A)
Blue = Vout (SlotB)

Circuit Example:



**Figure 1: Typical Application Circuit**