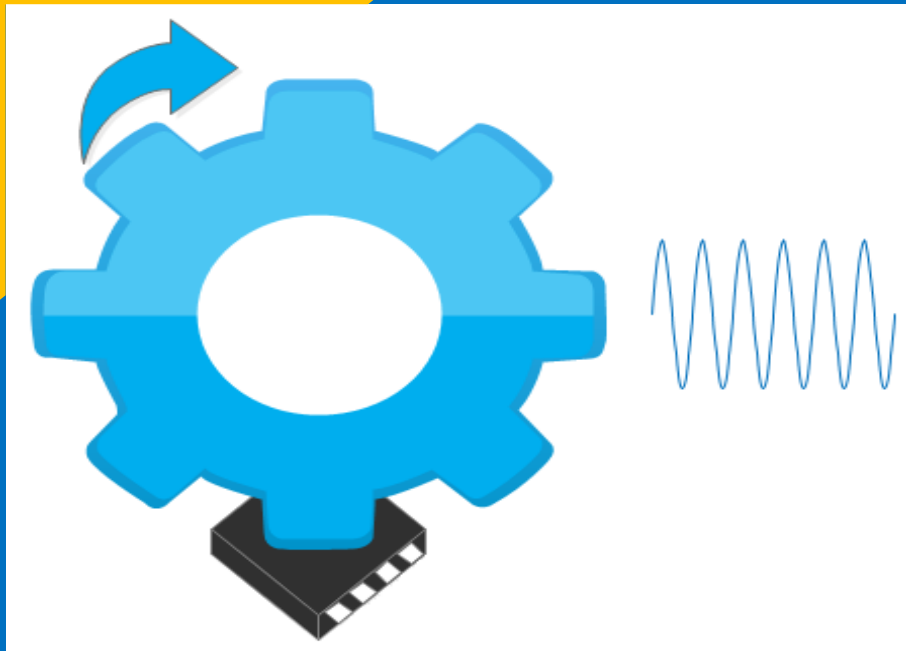


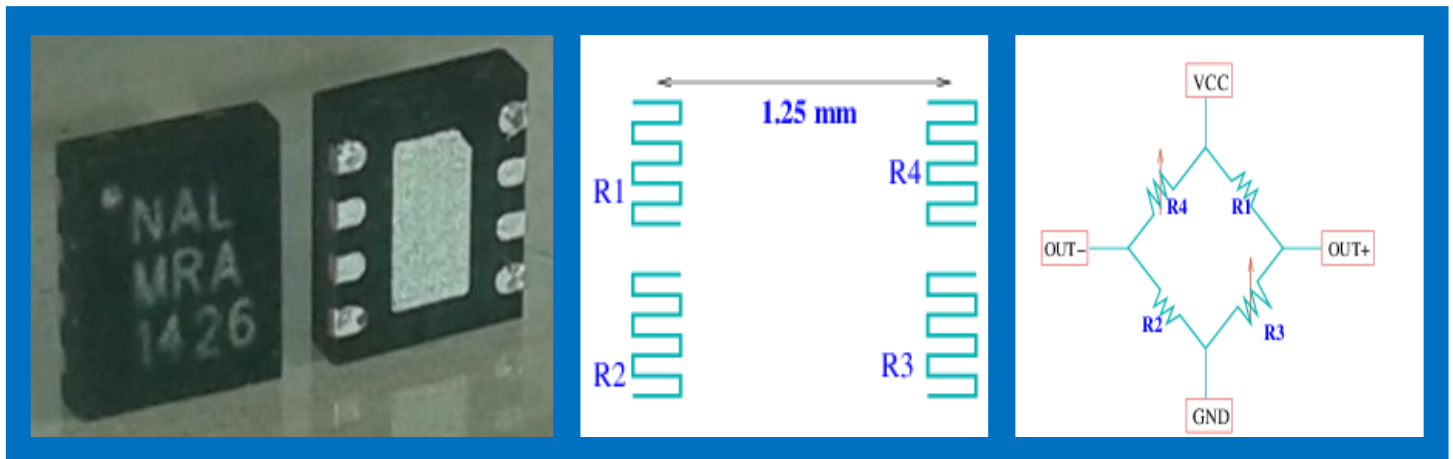
MAGNETIC SENSOR BASED ON GIANT MAGNETO RESISTANCE (GMR) EFFECT



Developed by,



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Magnetic sensor in brief

Magnetoresistive sensing element (MRE) based on Giant Magneto-Resistance (GMR) properties are primarily developed to decode the information from linear or angular encoders made of ferrous materials. Low hysteresis and high sensitivity, smaller in size and cheaper cost make magnetic sensors suitable for wide range of applications. Moreover, these sensors, made of passive elements in Wheatstone's bridge configuration removes the limitation to use even in high frequencies ($0 < f < 1\text{MHz}$). The fabricated sensor (**NAL MRA 1426**) is in the form of 8 TDFN plastic package (3 mm x 3 mm) with each active element area of $250 \times 300 \mu\text{m}^2$. The sensor can produce large output voltages (in range of few hundred mV) and can be operated up-to an air gap as large as 10 mm.

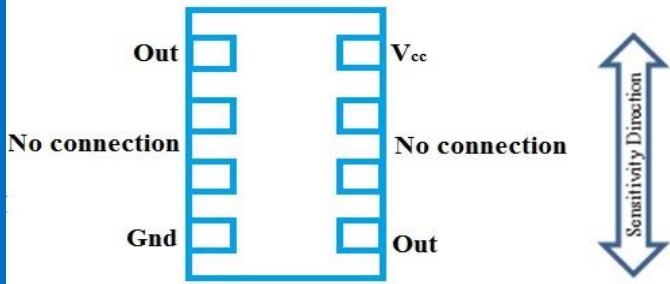
Specifications of NAL MRA 1426

Parameter	Minimum	Typical	Maximum	Unit
Single bridge resistance	6	6.3	6.8	k Ω
Input voltage	1	12	30	V
Linear range	± 5	-	± 100	G
Saturation of GMR sensor elements	- 150	-	+ 150	G
Single resistor sensitivity	-	0.08	-	%/G
Temperature coefficient of resistance	-	0.033	-	$\Omega/^\circ\text{C}$
Temperature dependence of GMR	-	- 0.03	-	%/°C
Storage temperature range	- 70	-	+ 175	°C
Operating temperature range	- 40	-	+ 150	°C
Non - Linearity	-	2	-	% (FS)
Hysteresis	-	9	-	% (FS)

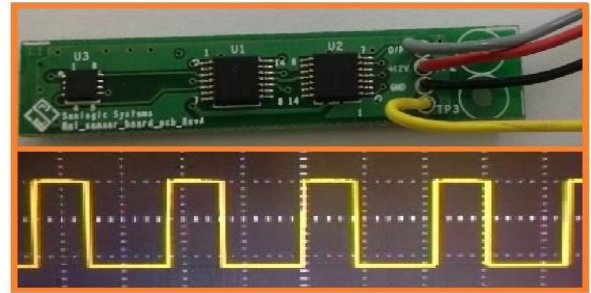
Notes

- The sensor is fabricated with a typical bridge resistance of 6.3 k Ω .
- It produces a pure ratiometric output for input voltages between 0.1V to 30V.
- The non-linearity and hysteresis were measured for unipolar operation.
- Thermal effects are compensated in the Wheatstone's bridge configuration.

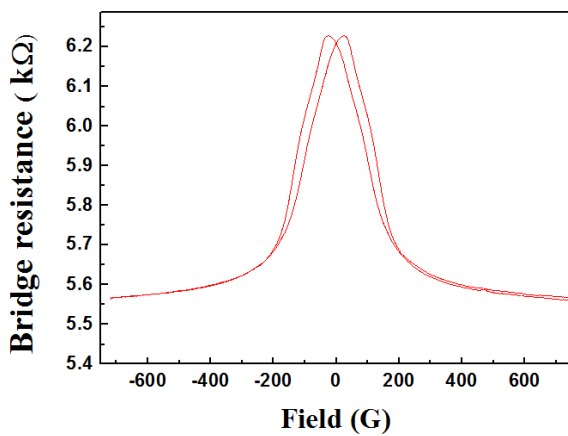
8-pin DFN package



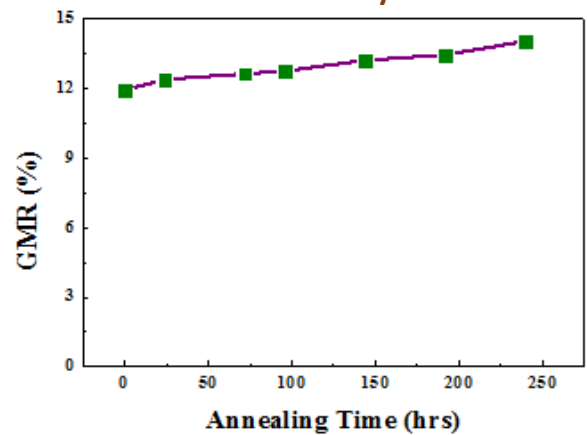
PCB with sensor and signal conditioning circuit



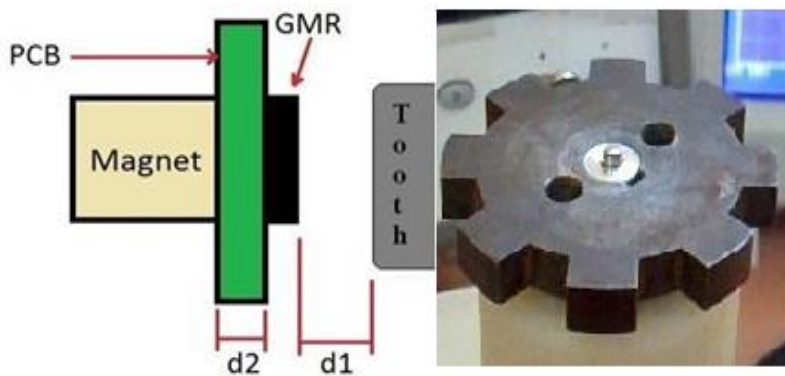
Bridge characteristics



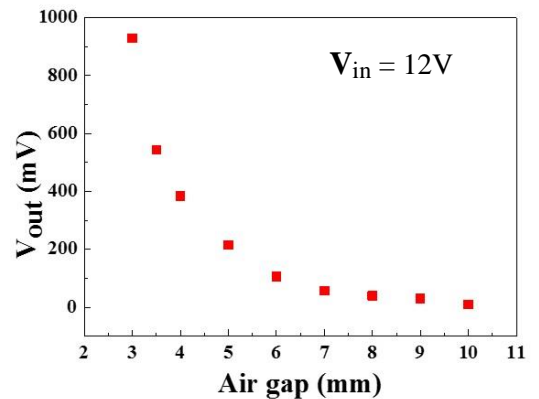
Thermal stability at 225°C



Schematic for speed sensing using sensor



Variation of output voltage with air gap



Features

- Larger air-gap
- High sensitivity
- Low hysteresis
- Good temperature stability
- Can handle large magnetic fields
- Small size and low cost

Applications

- Linear and angular speed sensing
- Linear and angular position sensing
- Current sensing
- Pressure sensing
- Eddy current probe measurement
- Implantable medical devices
- Power electronics modules
- Vibration detection
- Micro-Air Vehicle (MAV)

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Applications

Automotive

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+
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