

# Giant Magneto Resistive Position Sensor

GMR S 4

Version 1.0

Data Sheet

This angle sensor is based on the brand new Giant Magneto Resistive (GMR) technology. It is outstanding for the huge tolerances it offers to the user in assembly.

## Features

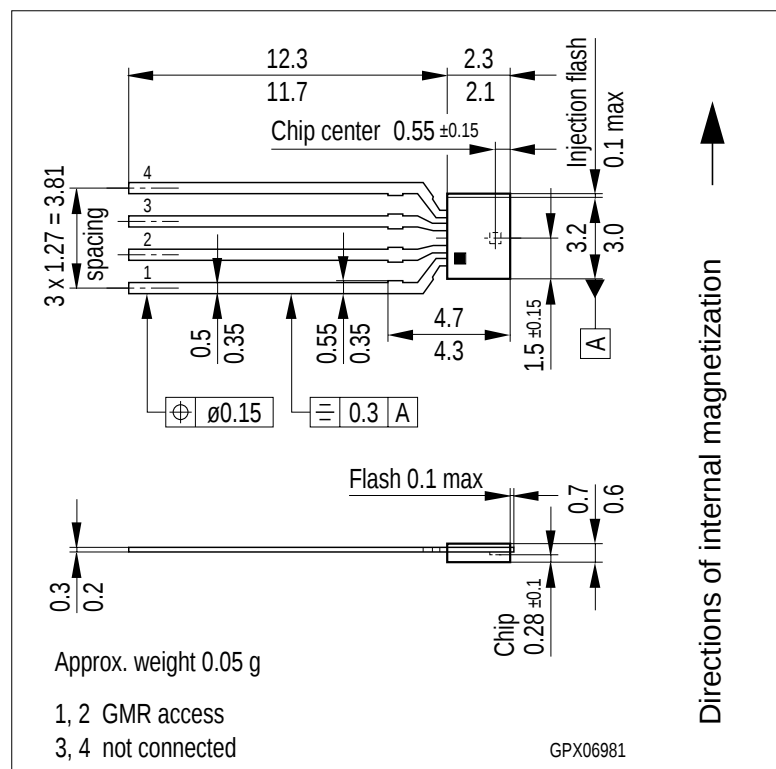
- GMR sensor on copper leadframe
- **Sensitive to the direction**, not to the intensity of the magnetic field
- Constant  $T_C$  of basic resistance  $R$  and magneto resistance  $\Delta R$

## Applications

- Rotation sensing with large air gaps according to sketch below
- Angle encoders
- Contactless potentiometers

## Pin Configuration

|      |                          |
|------|--------------------------|
| 1, 2 | supply voltage terminals |
| 3, 4 | not connected            |

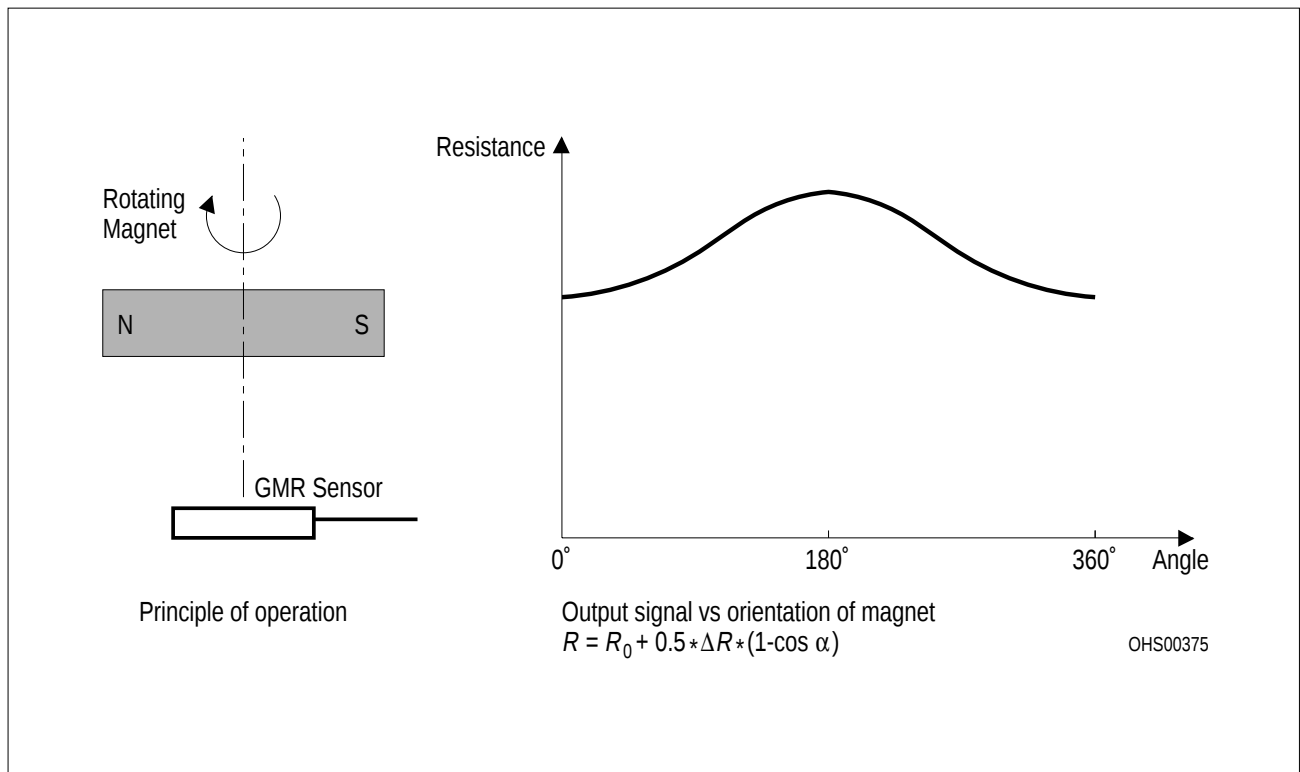


Dimensions in mm  
Internal magnetization is in direction of the longest side of the housing.

| Type      | Marking | Ordering Code |
|-----------|---------|---------------|
| ◆ GMR S 4 | ■       | Q62705-K5002  |

## ◆ new type

The GMR S 4 is an angle sensor based on sputtered metallic multilayer technology. The outstanding feature of this magnetic sensor is the fact that it is **sensitive to the orientation of the magnetic field** and not to its intensity as long as the field is in a range between 5 ... 15 kA/m. **This means, the signal output of this sensor is independent of the sensor position relative to the magnet in lateral, axial or rotational direction in the range of several millimeters.** Optimum results are achieved by using magnetic targets like permanent magnets or magnetic pole-wheels. **There is no need for a biasing magnet!** Due to the linear change of both, basic and field dependent part of the resistance vs. temperature, simple and efficient electronic compensation of  $T_C$  ( $R$ ,  $\Delta R$ ) is possible.



## Maximum Ratings

| Parameter                    | Symbol      | Value          | Unit |
|------------------------------|-------------|----------------|------|
| Operating temperature        | $T_A$       | - 40 ... + 150 | °C   |
| Storage temperature          | $T_{stg}$   | - 50 ... + 150 | °C   |
| Supply current               | $I_1$       | 5              | mA   |
| Thermal conductivity         | $G_{thC} A$ | > 2.2          | mW/K |
|                              | $G_{thC} C$ | > 5            | mW/K |
| Magnetic field <sup>1)</sup> | $H_{rot}$   | < 15           | kA/m |

<sup>1)</sup> larger fields may reduce the magnetoresistive effect irreversibly

**Characteristics ( $T_A = 25\text{ °C}$ )**

| Parameter                                                            | Symbol             | Value             | Unit     |
|----------------------------------------------------------------------|--------------------|-------------------|----------|
| Nominal supply current                                               | $I_{1N}$           | 4                 | mA       |
| Basic resistance                                                     | $R_0$              | > 700             | $\Omega$ |
| Magnetoresistive effect<br>$H_{\text{rot}} = 5 \dots 15\text{ kA/m}$ | $\Delta R/R_0$     | $\approx 4$       | %        |
| Temperature coefficient of<br>basic resistance                       | $TC_{R0}$          | + 0.09 ... + 0.12 | %/K      |
| Temperature coefficient of<br>magnetoresistance                      | $TC_{\Delta R}$    | – 0.12 ... – 0.09 | %/K      |
| Temperature coefficient of<br>magnetoresistive effect                | $TC_{\Delta R/R0}$ | – 0.27 ... – 0.23 | %/K      |
| Hysteresis at $H_{\text{rot}} = 10\text{ kA/m}$                      | $H_{\text{ys}}$    | < 2               | degrees  |

**Application Hints**

The application mode of the GMR position sensor is preferably as a bridge or halfbridge circuit. In every case this type of circuit compensates for the  $T_C$  of the resistance value  $R_0$ . To compensate for the  $T_C$  of the GMR effect  $\Delta R/R_0$ , if there is the necessity, is left to the application circuit and can be done for example with a NIC circuit. When operated over a complete  $360^\circ$  turn, a total signal of  $\approx 20\text{ mV/V}$  is achieved at  $25\text{ °C}$  with a halfbridge. The output signal is doubled when a fullbridge circuit is used. In the case of linear position sensing, the electrical circuit remains unchanged.