Differential Magnetoresistive Sensor CY-DMR-03

Features
- Sensing over wide rotation speed range (0~100kHz)
- Robust metallic or plastic housing
- Signal amplitude is speed independent
- Biasing magnet built in
- Best suited for harsh environments

Typical applications
- Rotation speed detection
- Rotation position detection
- Proximity Switch
- Angle encoder
- Linear position sensing

The differential magnetoresistive sensor CY-DMR-03 consists of two series coupled magnetoresistors (D-type InSb/NiSb semiconductor resistors whose value can be magnetically controlled), which are mounted onto an insulated ferrite substrate. The sensor is encapsulated in a metallic package and has 3 connection terminals. The basic resistance of the total system is 2 x 250Ω. A permanent magnet, which supplies a biasing magnetic field, is fixed on the base of the sensor.

Sensor Outline
### Sensor Circuits

#### a) Without Amplifier

![Circuit Diagram]

- 3: V+ power supply (+5V),
- 2: \( V_{out} \) Output signal,
- 1: GND

#### b) Built-In Inner Amplifier

![Circuit Diagram]

- 3: V+ (+5V),
- 2: \( V_{out} \) Output signal,
- 1: GND

### Specifications

<table>
<thead>
<tr>
<th>Part numbers</th>
<th>CY-DMR-03A</th>
<th>CY-DMR-03B</th>
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</thead>
<tbody>
<tr>
<td>Built-in Inner amplifier</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Maximum power supply ( V_{max} )</td>
<td>10V DC</td>
<td>5.5V DC</td>
</tr>
<tr>
<td>Nominal power supply</td>
<td>5V DC</td>
<td>5V DC</td>
</tr>
<tr>
<td>Inner total resistance ( R_{1,3} ) (( \delta=\infty ), ( I_{\leq mA}, t=25^\circ C ))</td>
<td>700 Ω – 1500 Ω</td>
<td>700 Ω – 1500 Ω</td>
</tr>
<tr>
<td>Center symmetry ( M=100% ) (( R_{1,2}-R_{2,3} )) / ( R_{1,2} ) (( \delta=\infty ))</td>
<td>( \leq 10% )</td>
<td>( \leq 10% )</td>
</tr>
<tr>
<td>Offset voltage (at ( Vin ) and ( \delta=\infty ))</td>
<td>( \leq 130mV )</td>
<td>( \leq 130mV )</td>
</tr>
<tr>
<td>Open circuit output voltage ( V_{out_{pp}} ) (at ( Vin ) and ( \delta=0.15mm ))</td>
<td>( \geq 1100mV )</td>
<td>3500mV</td>
</tr>
<tr>
<td>Frequency range</td>
<td>0-100kHz</td>
<td>0-100kHz</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C ~ +80°C</td>
<td>-20°C ~ +80°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40°C ~ +85°C</td>
<td>-40°C ~ +85°C</td>
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Standard target object: 1.8x5x4mm (1.8x5mm face moves in the sensing direction of the sensor).

### Cross Reference

<table>
<thead>
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<th>Cross reference</th>
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<tbody>
<tr>
<td>CY-DMR-03A</td>
<td>MuRata FR05CM21AR</td>
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<tr>
<td>CY-DMR-03B</td>
<td>---</td>
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</tbody>
</table>

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Measurement Arrangement

A measuring bridge is used for applications of the magnetoresistive sensor CY-DMR-03. The resistance of the sensor is changed by approaching a small soft iron part (standard target object) close to it. As result an output voltage change of measuring bridge is caused by the resistance change (see below).

Sensor CY-DMR-03A

Sensor CY-DMR-03B
To convert small distance into a proportional electric signal, one can use a small soft iron part with definite width (e.g. b=1.8mm) to move over the face of the sensor. A linear signal up to 1.5mm can be obtained in this way. The sinusoidal signal gives a voltage output proportional to the distance in the zero crossover region.

For digital revolution counting, the sensor should be actuated by a magnetic soft iron tooth wheel. The tooth spacing should correspond to about twice of the magneto resistor intercenter space i.e. 2x1.6mm.

The two resistors of the sensor are supplemented by two additional resistors in order to obtain the sensor output voltage as a bridge voltage $V_{OUT}$. The output voltage $V_{OUT}$ without excitation is then 0V because the offset is compensated by the bridge circuit.