Features

- Analog output voltage proportional to the magnetic flux density
- Magnetic sensitivity 130mV/mT (typ.)
- Supply voltage from 3.0V to 5.5V at single power supply
- Operating temperature range from -40°C to 100°C
- Ratio-metric analog output
- 3pin single in-line package (SIP), Halogen free
- Quick response 2μs (typ.)
- Low output noise voltage 10mVp-p

Operational Characteristics

Block Diagram

Figure 1. Definition of sensitivity direction
Figure 2. Output characteristics
Figure 3. Block diagram
### Absolute Maximum Ratings

**Table 2. Absolute maximum ratings (T_A = 25°C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>V_CC</td>
<td>−0.3</td>
<td>+6.0</td>
<td>V</td>
</tr>
<tr>
<td>Output current</td>
<td>I_OUT</td>
<td>−1.2</td>
<td>+1.2</td>
<td>mA</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>T_A</td>
<td>−40</td>
<td>+100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_STG</td>
<td>−40</td>
<td>+125</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note) Stresses beyond these listed values may cause permanent damage to the device.

### Recommended Operating Conditions

**Table 3. Recommended operating conditions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>V_CC</td>
<td>3.0</td>
<td>5.0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Output current</td>
<td>I_OUT</td>
<td>−1.0</td>
<td>1.0</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Load capacitance</td>
<td>C_L</td>
<td></td>
<td>1000</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

### Electrical & Magnetic Characteristics

**Table 4. Electrical & Magnetic Characteristics (T_A = 25°C, V_CC = 5V unless otherwise noted)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption</td>
<td>I_CC</td>
<td>B = 0mT with no load</td>
<td></td>
<td>9</td>
<td>12</td>
<td>mA</td>
</tr>
<tr>
<td>Magnetic sensitivity</td>
<td>V_h</td>
<td>B = ±11mT with no load</td>
<td>110</td>
<td>130</td>
<td>150</td>
<td>mV/mT</td>
</tr>
<tr>
<td>Quiescent voltage</td>
<td>V_OUT0</td>
<td>B = 0mT</td>
<td>2.3</td>
<td>2.5</td>
<td>2.7</td>
<td>V</td>
</tr>
<tr>
<td>Linearity</td>
<td>ρ</td>
<td>B = ±13mT</td>
<td>−0.5</td>
<td>0.5</td>
<td>%F.S.</td>
<td></td>
</tr>
<tr>
<td>Output saturation</td>
<td>V_SATH</td>
<td>I_OUT = −1mA</td>
<td>V_CC−0.3</td>
<td></td>
<td>V_CC</td>
<td>V</td>
</tr>
<tr>
<td>voltage H</td>
<td>V_SATL</td>
<td>I_OUT = 1mA</td>
<td>0</td>
<td>0.3</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Ratiometry sensitivity</td>
<td>V_h-R</td>
<td>B = ±11mT with no load</td>
<td>−3</td>
<td>3</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>error</td>
<td>V_OUT0-R</td>
<td>B = 0mT</td>
<td>−3</td>
<td>3</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>
(1) See Characteristic Definitions section.
(2) See Characteristic Definitions section.
(3) Guaranteed by design.
(4) Specified only in case Vcc=3.0V, and 5.5V. See Characteristic Definitions section.

Figure 5. Input voltage range
Typical Characteristics

The following values are for reference only.

<Electrical Characteristics>

Table 5. Typical Electrical Characteristics (T_A = 25°C, V_{CC} = 5V)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time</td>
<td>t_{RES}</td>
<td>Rising: Input magnetic field 90% → Output voltage 90%</td>
<td>2</td>
<td></td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Falling: Input magnetic field 10% → Output voltage 10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1~2μs Input magnetic field rising/falling)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_L = 1000pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rise time</td>
<td>t_{RISE}</td>
<td>Output voltage 10% → 90%</td>
<td>3</td>
<td></td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1~2μs Input magnetic field rising/falling)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_L = 1000pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>t_{FALL}</td>
<td>Output voltage 90% → 10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1~2μs Input magnetic field rising/falling)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_L = 1000pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction time</td>
<td>t_{REAC}</td>
<td>Rising: Input magnetic field 10% → Output voltage 10%</td>
<td>0.3</td>
<td></td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Falling: Input magnetic field 90% → Output voltage 90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1~2μs Input magnetic field rising/falling)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_L = 1000pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bandwidth</td>
<td>f_{T}</td>
<td>at −3dB</td>
<td>140</td>
<td></td>
<td></td>
<td>kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_L = 1000pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output noise</td>
<td>V_{NP-P}</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>mVp-p</td>
</tr>
</tbody>
</table>

(Note: 1mT = 10G)

Figure 6. Example of step response
<Temperature Characteristics>

\[ V_{CC} = 5V \]

![Figure 7. Magnetic sensitivity](image1)

![Figure 8. Temperature Drift of Magnetic Sensitivity (Based on \( T_A = 25^\circ C \))](image2)

![Figure 9. Quiescent Voltage](image3)

![Figure 10. Temperature Drift of Quiescent Voltage (Based on \( T_A = 25^\circ C \))](image4)

<Output Characteristics>

\[ T_A = 25^\circ C, \ V_{CC} = 5V \]

![Figure 11. Output characteristics](image5)
Characteristic Definitions

(1) **Magnetic sensitivity** $V_h$ (mV/mT)

Magnetic sensitivity is defined as the slope of the least square regression line of three points in magnetic-electric transformation relation; Quiescent voltage $V_{OUT0}$, $V_{OUT} (+B)$, $V_{OUT} (-B)$ (B is defined in condition in electrical characteristics table).

(2) **Linearity** $\rho$ (%F.S.)

Linearity is defined as the ratio of a error voltage against full scale (F.S.). Where error voltage is calculated as the difference of three points (described below) from the straight line described in definition (1) Magnetic sensitivity. The three points are; Quiescent voltage $V_{OUT0}$, $V_{OUT} (+B)$ and $V_{OUT} (-B)$ (B is defined in condition in electrical characteristics table, and $I_{OUT}$ for each $V_{OUT}$ are defined in measurement condition shown below).

<Measurement Condition>
- 0mT applied : $I_{OUT} = 0mA$
- +BmT applied : $I_{OUT} = +1.0mA$ (Flow out from output)
- −BmT applied : $I_{OUT} = -1.0mA$ (Flow into output)

$$\rho = \frac{V_{OUT}(B) - (V_h \times B + V_{int})}{V_{OUT}(+B) - V_{OUT}(-B)} \times 100$$

Where full scale (F.S.) is defied as $V_{OUT} (+B) - V_{OUT} (-B)$, and $V_{int}$ is y-intercept of the line described in definition (1) Magnetic sensitivity.

(3) **Ratiometry sensitivity error** $V_{h-R}$ (%) and **Ratiometry quiescent voltage error** $V_{OUT0-R}$ (%)

Ratiometry error is defined as the ratio of the variation of magnetic sensitivity and quiescent voltage at 3V and 5V as shown in following equations.

$$V_{h-R} = \frac{V_h(3V) - V_h(5V)}{5 - 3} \times 100$$

$$V_{OUT0-R} = \frac{V_{OUT0}(3V) - V_{OUT0}(5V)}{5 - 3} \times 100$$

(4) **Response time** $t_{RES}$ (µs)

Response time is defined as the time from 90% reach point of input magnetic field in rise up (10% reach point in fall down) to the 90% reach point of output voltage in rise up (10% reach point in fall down), under a pulse magnetic field input (see Figure .12).

(5) **Rise time** $t_{RISE}$ and **Fall time** $t_{FALL}$ (µs)

Rise time is defined as the time from 10% reach point to 90% reach point of output voltage, under a pulse magnetic field input (see Figure .12).
Fall time is defined as the time from 90% reach point to 10% reach point of output voltage, under a pulse magnetic field input (see Figure 12).

(6) Reaction time  \( t_{\text{REAC}} (\mu s) \)
Response time is defined as the time from 10% reach point of input magnetic field in rise up (90% reach point in fall down) to 10% reach point of output voltage in rise up (90% reach point in fall down), under a pulse magnetic field input (see Figure 12).

Note) Rise time and fall time of input pulse magnetic field is 1~2\( \mu s \).

**Figure 12.** Relations of the input magnetic field and \( t_{\text{RES}}\), \( t_{\text{RISE}}\), \( t_{\text{FALL}}\), \( t_{\text{REAC}}\)
Package Outline

(Unit: mm)

Note 1) The center of the sensor is located within the φ0.3mm circle.
Note 2) Tolerances of dimension otherwise noted is ±0.1mm.
Note 3) The metal portions on the package side (support lead) are connected to the internal circuits.
      The support lead should be isolated from the external circuit and the other support lead.

Package type:
Material of terminals:
Material of plating for terminals:
Plating thickness:

1: VCC
2: GND
3: OUT
Marking

Marking is performed by laser.

![Marking Diagram](image)

- Product distinction code (EQ-730L)
- Manufactured code (YMDL)

Figure 14. Marking

Recommended External Circuit

![Recommended Circuit Diagram](image)

- Input: Vcc=5V
- Output: 0.1µF
- Connections: GND, VCC, OUT

Figure 15. Recommended external circuit
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