



## KMT37

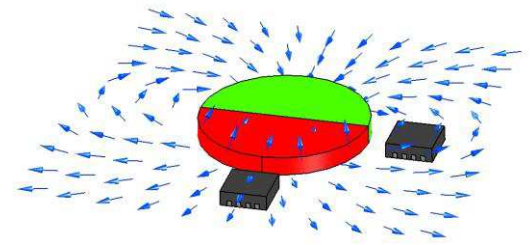
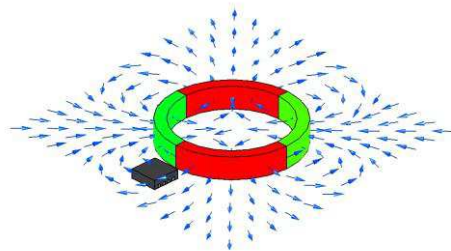
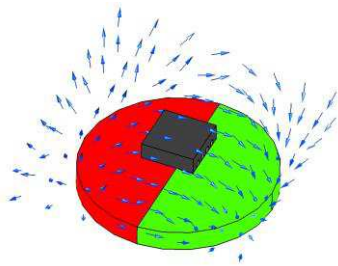
### Magnetic Angle Sensor

#### SPECIFICATIONS

- ✦ AMR Sensor with 180° period
- ✦ For the use at moderate field strengths
- ✦ High accuracy
- ✦ Reliable SO8-package
- ✦ Qualified for automotive applications

The KMT37 is a magnetic field sensor based on the anisotropic magneto resistance effect, i.e. it is sensing the **magnetic field direction** independently on the magnetic field strength for applied field strengths  $H \geq 14$  kA/m. The sensor contains two parallel supplied Wheatstone bridges, which enclose a sensitive angle of 45 degrees.

A rotating magnetic field in the surface parallel to the chip (x-y plane) will deliver two independent sinusoidal output signals, one following a  $\cos(2\vartheta)$  and the second following a  $\sin(2\vartheta)$  function,  $\vartheta$  being the angle between sensor and field direction (See Figure 2).



#### FEATURES

- ✦ Contactless angular position
- ✦ Design optimized linearity
- ✦ High accuracy
- ✦ Low cost, low power
- ✦ Self diagnosis feature
- ✦ User has complete control over signal evaluation
- ✦ Reliable SO8-Package
- ✦ High rotational speed possible
- ✦ Extended operating temperature range
- ✦ (-40 °C to +150 °C)
- ✦ Ideal for harsh environments due to magnetic sensing principle
- ✦ RoHS compliant (lead free)

#### APPLICATIONS

- ✦ Absolute and incremental angle measurement
- ✦ Motor motion control
- ✦ Robotics
- ✦ Camera positioning
- ✦ Potentiometer replacement
- ✦ Position measurement in medical applications
- ✦ Automotive (steering angle, torque, etc.)

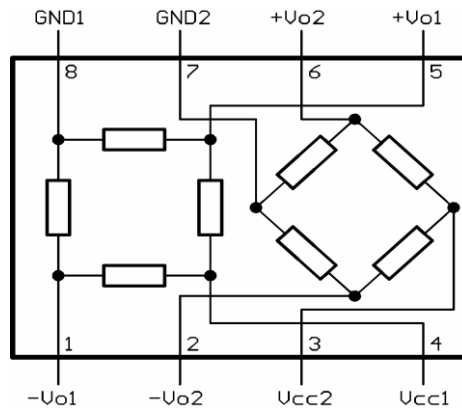
**CHARACTERISTIC VALUES**

| Parameter                       | Condition | Symbol          | Min | Typ | Max  | Unit |
|---------------------------------|-----------|-----------------|-----|-----|------|------|
| <b>Absolute maximum ratings</b> |           |                 |     |     |      |      |
| Supply voltage                  |           | V <sub>CC</sub> |     |     | 10   | V    |
| Operating temperature           |           | T <sub>OP</sub> | -40 |     | +150 | °C   |
| Storage temperature             |           | T <sub>ST</sub> | -50 |     | +150 | °C   |
| <b>Operating conditions</b>     |           |                 |     |     |      |      |
| Supply voltage                  |           | V <sub>CC</sub> | 0   | 5   | 8.5  | V    |
| Applied magnetic field          |           | H               | 14  | 25  | 400  | kA/m |

| <b>General parameters</b>        |  |                                   |  |             |             |                |
|----------------------------------|--|-----------------------------------|--|-------------|-------------|----------------|
| Bridge resistance                | T = 25 °C                              | R <sub>B</sub>                    | 2.4  | 3.0         | 3.6         | k <sub>Ω</sub> |
| max. signal amplitude            | T = 25 °C, H = 25 kA/m                 | ↔V/V <sub>CC</sub>                | 9  | 11          | 13          | mV/V           |
| Offset voltage 2)                | T = 25 °C, H = 25 kA/m                 | V <sub>OFF</sub> /V <sub>CC</sub> | -1   |             | +1          | mV/V           |
| Hysteresis 1)<br>(Repeatability) | H = 14 kA/m<br>H = 25 kA/m             | Hyst                              |  | 0.1<br>0.05 | 0.4<br>0.1  | deg            |
| Accuracy 1)                      | H = 14 kA/m<br>H = 25 kA/m             | ↔↔                                |  | 0.1<br>0.05 | 0.5<br>0.15 | deg            |
| TC of amplitude                  | H = 25 kA/m, 3)                        | TC <sub>SV</sub>                  |  | -0.35       |             | %/K            |
| TC of bridge resistance          | 3)                                     | TC <sub>BR</sub>                  |  | +0.35       |             | %/K            |
| TC of offset voltage             | H = 25 kA/m, 1), 2)                    | TC <sub>Voff</sub>                | -4   | 0           | +4          | μV/V/K         |
| Amplitude synchronism            | H = 25 kA/m, 4)                        | k                                 | 99.5   | 100         | 100.5       | %              |
| Sensitivity<br>(zero crossing)   | H = 25 kA/m, 4),<br>↔1 = 135°, ↔2 = 0° | S↔1 or<br>S↔2                     | ↔V <sub>n</sub> /V <sub>CC</sub> [mV/V] x ▲ / 180° |             |             | mV/V/deg       |
| Peak output voltage              | H = 25 kA/m, V <sub>CC</sub> = 5 V, 4) | V <sub>poπ</sub>                  | 45   | 55          | 65          | mV/V           |

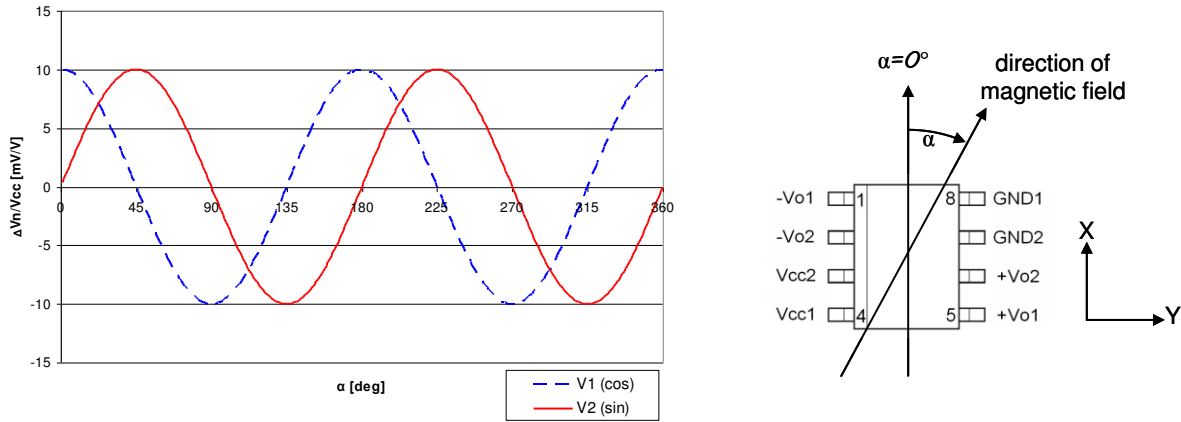
- 1) Hysteresis and accuracy are depending nearly inversely proportional on the magnetic field strength. The accuracy is defined as the max. angular difference between actual field angle and measured angle calculated from the third and fifth harmonics of the Fourier spectrum. The hysteresis is defined as angular difference between left and right turn.
- 2) Offset voltages are calculated by measuring both output voltages at several field angles between 0 and 360°, then drawing a diagram with the output voltages as axis and fitting a circle to the signal points. The Offsets are the coordinates of the circle center.
- 3) Reference temperature (Temp. with parameter value = 100%) T<sub>ref</sub> = -25 °C, calculated from values at -25°C and +125 °C.
- 4) This parameter is given for reference only and is not measured on a regular basis.

**BLOCK DIAGRAM**



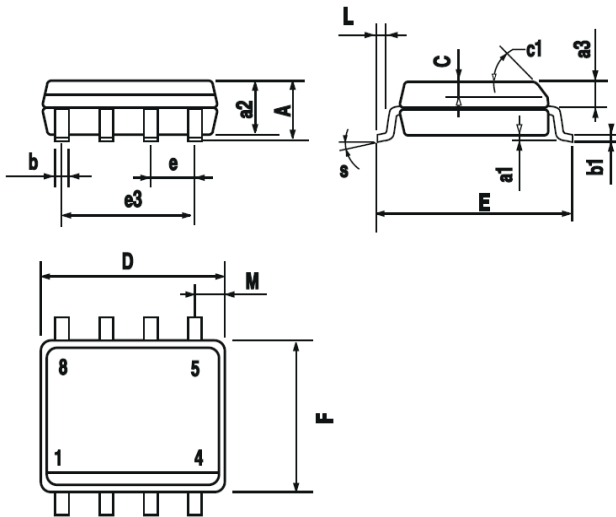
**Figure 1:** internal and external connections

**TYPICAL PERFORMANCE CURVES**



**Figure 2:** Characteristic curves for KMT37

**SENSOR OUTLINE**



| DIM.  | mm         |      |      | inch  |       |       |
|-------|------------|------|------|-------|-------|-------|
|       | MIN.       | TYP. | MAX  | MIN.  | TYP.  | MAX   |
| A     |            |      | 1.75 |       |       | 0.069 |
| a1    | 0.1        |      | 0.25 | 0.004 |       | 0.010 |
| a2    |            |      | 1.65 |       |       | 0.065 |
| a3    | 0.65       |      | 0.85 | 0.026 |       | 0.033 |
| b     | 0.35       |      | 0.48 | 0.014 |       | 0.019 |
| b1    | 0.19       |      | 0.25 | 0.007 |       | 0.010 |
| C     | 0.25       |      | 0.5  | 0.010 |       | 0.020 |
| c1    | 45° (typ.) |      |      |       |       |       |
| D (1) | 4.8        |      | 5.0  | 0.189 |       | 0.197 |
| E     | 5.8        |      | 6.2  | 0.228 |       | 0.244 |
| e     |            | 1.27 |      |       | 0.050 |       |
| e3    |            | 3.81 |      |       | 0.150 |       |
| F (1) | 3.8        |      | 4.0  | 0.150 |       | 0.157 |
| L     | 0.4        |      | 1.27 | 0.016 |       | 0.050 |
| M     |            |      | 0.6  |       |       | 0.024 |
| S     | 8° (max.)  |      |      |       |       |       |

**Figure 3: SO8-Package**

**PIN ASSIGNMENT**

| Pin | Symbol           | Function                         |
|-----|------------------|----------------------------------|
| 1   | -V <sub>o1</sub> | negative output bridge 1         |
| 2   | -V <sub>o2</sub> | negative output bridge 2         |
| 3   | V <sub>cc2</sub> | positive supply voltage bridge 2 |
| 4   | V <sub>cc1</sub> | positive supply voltage bridge 1 |
| 5   | +V <sub>o1</sub> | positive output bridge 1         |
| 6   | +V <sub>o2</sub> | positive output bridge 2         |
| 7   | GND <sub>2</sub> | negative supply voltage bridge 2 |
| 8   | GND <sub>1</sub> | negative supply voltage bridge 1 |

**SOLDER PROFILE**

Recommended solder reflow process according to IPC/JEDEC J-STD-020D (Pb-Free Process)

## KMT37

Angular Sensor

### ORDERING CODE

| DEVICE | DELIVERY FORM | MOQ                | PART NUMBER |
|--------|---------------|--------------------|-------------|
| KMT37  | TnR           | 1 Reel (2500 pcs.) | G-MRCO-037  |
| KMT37  | Tube          | 1 Tube             | on request  |

### ORDERING INFORMATION

#### NORTH AMERICA

Measurement Specialties, Inc.,  
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