

AL802

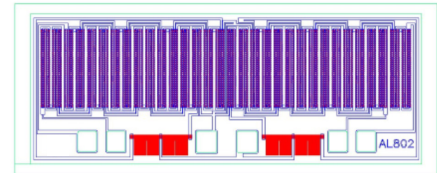
MagnetoResistive FixPitch Sensor

The AL802 is an Anisotropic MagnetoResistive (AMR) position sensor. The sensor contains two Wheatstone bridges shifted against each other. The output signals are proportional to sine and cosine of the coordinate to be measured.

The MR strips of this FixPitch sensor geometrically match to a polepair length of 0.5 mm (equal to a magnetic period of 0.5 mm).

The resistances in this FixPitch sensor are distributed in a PurePitch design (4 poles), thus the errors in the measurement scale are reduced without any signal delay.

It is necessary to operate the sensor with a stabilizing field (bias field).



Product Overview

| Article Description | Package | Delivery Type |
|---------------------|----------------------------|------------------------|
| AL802ACA-AC | Bare die | Waffle pack (200 pcs.) |
| AL802ACA-AB | Die on wafer ¹⁾ | Waferbox |

¹⁾ Minimum order quantities apply.

Quick Reference Guide

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|------------------|--------------------------------|------|------|------|-------------|
| P | Pitch (per magnetic pole pair) | - | 0.5 | - | mm |
| V _{CC} | Supply voltage | - | 5.0 | - | V |
| V _{off} | Offset voltage per VCC | -0.1 | - | +0.1 | mV/V |
| S | Sensitivity ²⁾ | 3.0 | 3.5 | 4.0 | mV/V / kA/m |
| R _B | Bridge resistance | 5.0 | 5.6 | 6.4 | kΩ |

²⁾ Periodical differential field with a periodicity of 0.5 mm.

Absolute Maximum Ratings

| Symbol | Parameter | Min. | Max. | Unit |
|------------------|---------------------|------|------|------|
| V _{CC} | Supply voltage | -9 | +9 | V |
| T _{amb} | Ambient temperature | -40 | +125 | °C |
| T _{stg} | Storage temperature | -65 | +150 | °C |

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Features

- Based on the Anisotropic MagnetoResistive (AMR) effect
- Contains two Wheatstone bridges on chip
- PurePitch design (4 poles)
- Ambient temperature range from -40 °C to +125 °C

Advantages

- Contactless angle and position measurement
- Insensitive to interference field
- Minimized offset voltage
- Negligible hysteresis
- Works with active or passive scales

Applications

Incremental or absolute encoder for linear or rotary movements in various industrial applications.



ESD

Magnetical Data

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|----------------------------|------------|------|------|------|------|
| H_x | Stabilizing magnetic field | | - | 3.0 | - | kA/m |

Electrical Data

$T_{amb} = 25\text{ °C}$; $H_x = 3\text{ kA/m}$; $V_{CC} = 5\text{ V}$; unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------|--|--------------------------|-------|-------|-------|-----------------------|
| V_{CC} | Supply voltage | | - | 5.0 | - | V |
| V_{off} | Offset voltage per VCC | | -0.1 | - | +0.1 | mV/V |
| TC_{Voff} | Temperature coefficient of V_{off} ⁴⁾ | | -3.0 | - | +3.0 | ($\mu\text{V/V}$)/K |
| R_B | Bridge resistance ²⁾ | | 5.0 | 5.6 | 6.4 | k Ω |
| TC_{RB} | Temperature coefficient of R_B ³⁾ | | 0.24 | 0.28 | 0.32 | %/K |
| S | Sensitivity ⁴⁾ | | 3.0 | 3.5 | 4.0 | mV/V / kA/m |
| TC_S | Temperature coefficient of sensitivity ⁵⁾ | | -0.48 | -0.42 | -0.36 | %/K |
| $V_{off D}$ | Offset drift over time | $T_{amb} = 85\text{ °C}$ | -100 | - | +100 | $\mu\text{V/V}$ |

$$1) \quad TC_{Voff} = \frac{V_{off(T_2)} - V_{off(T_1)}}{T_2 - T_1} \quad \text{with } T_1 = +25\text{ °C}; T_2 = +125\text{ °C}.$$

2) Bridge resistance between pads 1 and 6, 2 and 5.

$$3) \quad TC_{RB} = 100 \cdot \frac{R_{B(T_2)} - R_{B(T_1)}}{R_{B(T_1)} \cdot (T_2 - T_1)} \quad \text{with } T_1 = +25\text{ °C}; T_2 = +125\text{ °C}.$$

4) Periodical differential field with a periodicity of 0.5 mm.

$$5) \quad TC_S = 100 \cdot \frac{S_{(T_2)} - S_{(T_1)}}{S_{(T_1)} \cdot (T_2 - T_1)} \quad \text{with } T_1 = +25\text{ °C}; T_2 = +125\text{ °C}.$$

Dynamical Data

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------------|------------|-------------------|------|------|------|
| f | Frequency range | | 1.0 ¹⁾ | - | - | MHz |

¹⁾ No significant amplitude attenuation.

General Data

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------|--------------------------------|------------|------|------|------|------|
| P | Pitch (per magnetic pole pair) | | - | 0.5 | - | mm |
| d | Distance ²⁾ | | - | 0.25 | - | mm |
| T _{amb} | Ambient temperature | | -40 | - | +125 | °C |
| T _{stg} | Storage temperature | | -65 | - | +150 | °C |

²⁾ Typical working distance, depends on the magnetic field strength of the scale.

Pinning

| Pad | Symbol | Parameter |
|-----|------------------|----------------------------------|
| 1 | +V _{O2} | Positive output voltage bridge 2 |
| 2 | +V _{O1} | Positive output voltage bridge 1 |
| 3 | V _{CC} | Supply voltage |
| 4 | GND | Ground |
| 5 | -V _{O1} | Negative output voltage bridge 1 |
| 6 | -V _{O2} | Negative output voltage bridge 2 |

Polarity of bridge outputs is defined as follows:

$$V_{O1} = (+V_{O1}) - (-V_{O1})$$

$$V_{O2} = (+V_{O2}) - (-V_{O2})$$

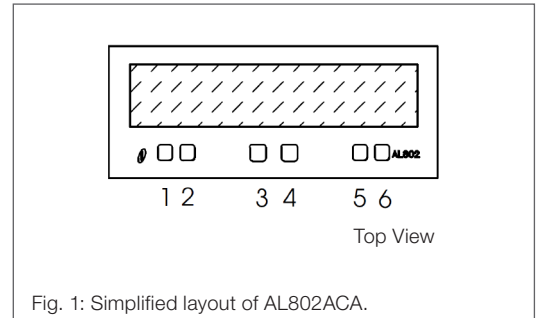


Fig. 1: Simplified layout of AL802ACA.

Dimensions

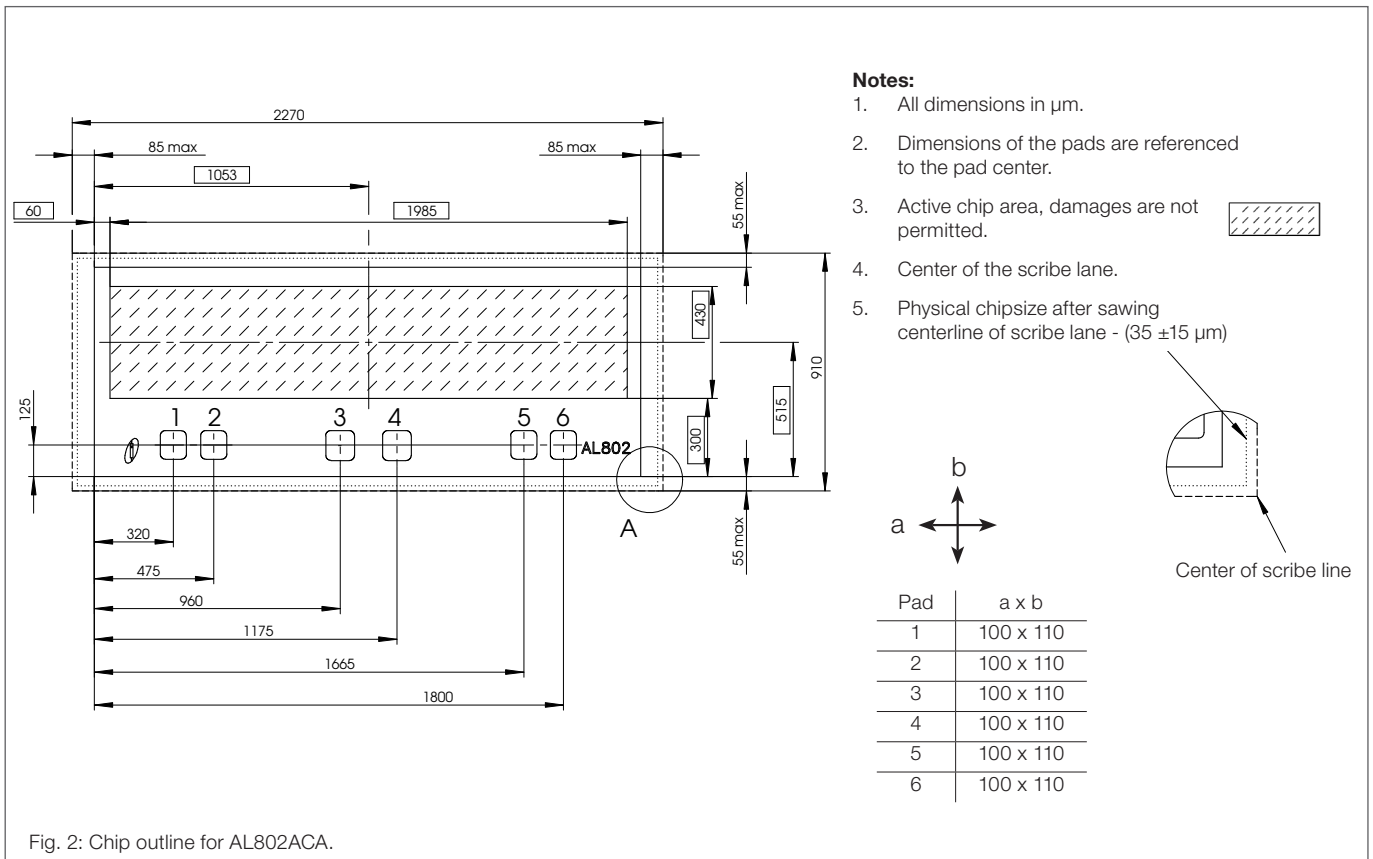


Fig. 2: Chip outline for AL802ACA.

Data for Packaging and Interconnection Technologies

| Parameter | Value | Unit |
|-------------------------|-------------|-----------------|
| Chip area ¹⁾ | 2.27 x 0.91 | mm ² |
| Chip thickness | 525 ± 10 | μm |
| Pad size | See Fig. 2 | - |
| Pad thickness | 0.8 | μm |
| Pad material | AlCu | - |

¹⁾ Tolerances of the chip size see fig. 2

General Information

Product Status

| Article | Status |
|-------------|---|
| AL802ACA-AC | The product is in series production. |
| AL802ACA-AB | The product is in series production. |
| Note | The status of the product may have changed since this data sheet was published. The latest information is available on the internet at www.sensitec.com . |

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Changelist

| Version | Description of the Change | Date |
|--------------|--------------------------------------|---------|
| AL802.DSE.04 | Disclaimer supplement | 06/2022 |
| AL802.DSE.03 | Change of corporate design (pp. 1-6) | 01/2022 |
| AL802.DSE.00 | Original (pp. 1-6) | 11/2012 |

Sensitec GmbH

Schanzenfeldstr. 2 · 35578 Wetzlar · Germany
 Tel. +49 6441 5291-0 · Fax +49 6441 5291-117
 www.sensitec.com · sensitec@sensitec.com