= Product brief =

AK09970

3-axis Magnetic Sensor with Programmable Switch

1. Genaral Description

AK09970 is a 3-axis magnetic sensor IC with high sensitivity and wide measurement range utilizing our latest hall sensor technology.
Our ultra-small package of AK09970 incorporates magnetic sensors, chopper stabilized signal, amplifier chain, and all necessary interface logic for detecting weak to strong magnetic fields in the X, Y and Z planes independently. From its compact foot print, thin package, and extremely low power consumption, it is suitable for a wide range of applications such as connected home, door & window opening/close sensing, and magnetic tamper detection of IoT systems or smart meters just to name a few.

2. Features

- Functions:
  - 16 bit data out for each 3-axis magnetic component
  - Programmable threshold 3-axis magnetometer
  - Built-in A to D Converter for magnetometer data output
  - Selectable sensor measurement range and sensitivity setting
    - High sensitivity setting
      - Sensitivity: 1.1 µT/LSB (typ.)
      - Measurement range: ± 36 mT
    - Wide range setting
      - Sensitivity: 3.1 µT/LSB (typ.)
      - Measurement range: X and Y-axis → ±34.9mT, Z-axis → ±101.5mT
  - Serial interface
    - I2C bus interface
      Standard and Fast mode compliant with Philips I2C specification Ver.2.1
    - 4-wire SPI
  - Operation mode
    - Power-down, Single measurement, Continuous measurement
  - 3-axis programmable switch function
  - Output pin for event notification
    - INT pin and OD-INT pin
  - DRDY function for measurement data ready
  - Magnetic sensor overflow monitor function
  - Built-in oscillator for internal clock source
  - Selectable sensor drive
    - Low power drive / Low noise drive

- Operating temperatures:
  - -40˚C to +85˚C
- Operating supply voltage:
  - +1.7V to +3.6V
- Current consumption (VDD = +1.8V):
  - Power-down: 2.0 nA (typ.)
  - Measurement:
    - Average current consumption at 1 Hz/10Hz repetition rate
      - Low power drive: 0.6 µA(typ.)@1HzODR, 2.7 µA(typ.)@10HzODR
      - Low noise drive: 1.5 µA(typ.) @1HzODR, 11.9 µA(typ.)@10HzODR
- Package
  - AK09970N 16-pin QFN package: 3.0mm x 3.0mm x 0.75mm

Preliminary

3. Overview

The AK09970 supports wide measurement range with high resolution in 3-axis detection and captures magnetic fields in 3-dimensions. With these abilities, it is great device for controlling the direction of security cameras and connected home, (smart home, smart house), smart locks, along with door and window open/close detection.

AK09970 has the following main features:

(1) Wide Measurement Range & High Resolution
The AK09970 has a wide measurement range of 35mT on 3 axes. In addition, further range of 101mT can be achieved via the Z axis. It is able to measure a wide range of magnetic field from microtesla to millitesla such as from geomagnetic to a magnet since it has high measurement resolution of 1.1uT/LSB in High Resolution mode.

(2) Low-power Consumption when Battery Life is Critical
The AK09970 can operate using only a few μA, thus consuming a very low current that satisfies a demand of IoT products, (Refer to the Specification Table). It contributes to a long battery life of a product that needs constant acquisition of sensor data to monitor an object's status.

(3) Magnetic Field Output (Digital)/ Data Ready Alert (DRDY bit)
The AK09970 measures magnetic field on all 3-axes via intermittent drive and outputs the result as digital data, (supporting I2C/SPI communications). It outputs a Data Ready alert to the dedicated register when the measurement data is updated. (0.25/0.5/1/10/20/15/100Hz interval modes or single measurement mode for intermittent drive options.)

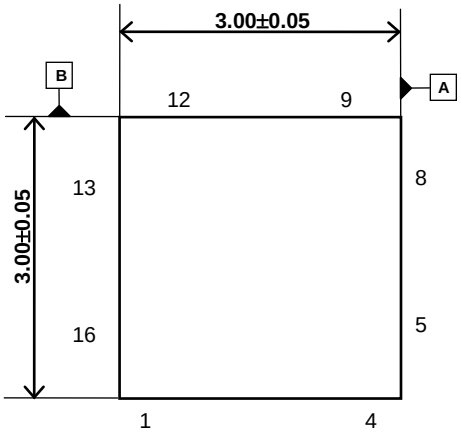
(4) Magnetic Event Interrupt Function
The AK09970 has magnetic event interrupt pins. Two thresholds can be programmed for each axis, (setting the resolution equal to the measuring resolution). When a magnetic field that exceeds the threshold is sent, the AK09970 outputs a "Magnetic Event" interrupt to registers or external output pins. The magnetic event that causes an interrupt output that can be selected freely by setting a register. (Data Ready alert mentioned in 3 can also be output from an interrupt pin). Two interrupt pins are available for magnetic event: the INT pin for push-pull output and the ODIN pin for open-drain output. Therefore, the output format can be selected depending on the customer's product.

Preliminary

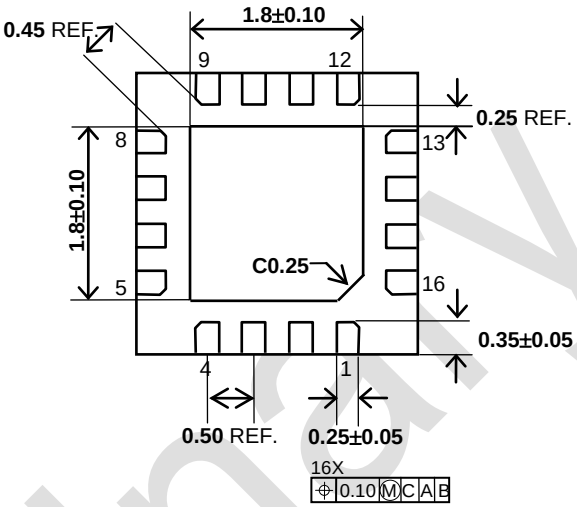
4. Package

4.1. Outline Dimensions

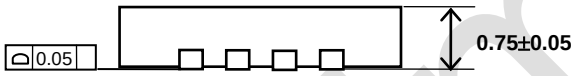
[mm]



<Top view>

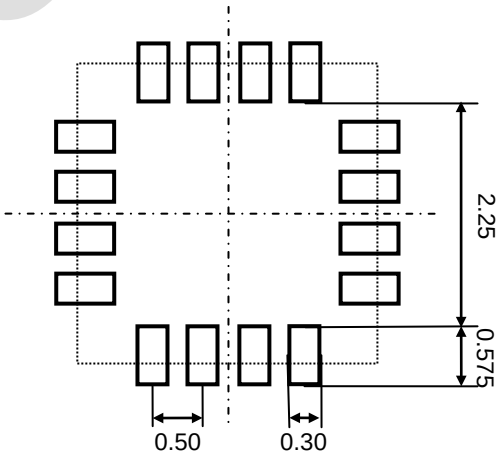


<Bottom view>



<Side view>

4.2. Pad Dimensions



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4.3. **Marking**

Product name: 9970

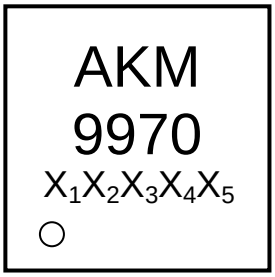
Date code: $X_1X_2X_3X_4X_5$

X1 = ID

X2 = Year code

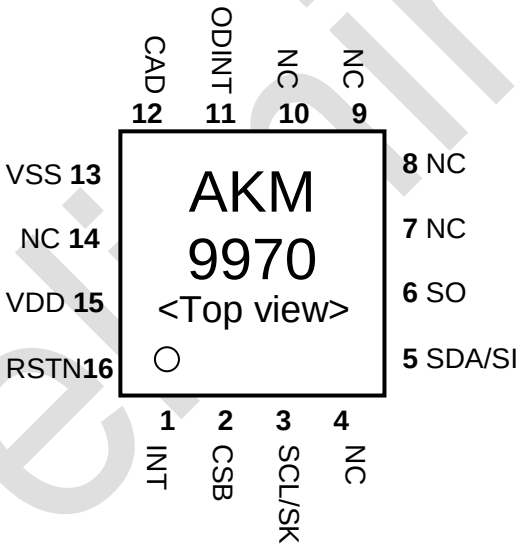
X3X4 = Week code

X5 = Lot



<Top view>

4.4. **Pin Assignment**



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