

 Product Brief	AK7455 Zero Latency Angle Sensor IC
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1. General Description

The AK7455 is a Silicon monolithic Hall-Effect sensor IC that specializes in detecting rotation angle. A contactless absolute magnetic rotary encoder is easily designed with the AK7455 and a magnet.

The AK7455 detects the horizontal magnetic field vector (Bx, By) with respect to the IC package. This is obtained through a magnetic concentrator which is mounted on the Hall-Effect elements. It is advantageous to accurate angular measurements against mechanical misalignment. It is also possible to set the magnetic field vector from horizontal to vertical (Bx/Bz or By/Bz), which contributes to improving the degree of freedom of positioning of the magnet and IC.

The AK7455 has built-in EEPROMs for angle INL error calibration function. It is possible to reduce the error caused by mounting misalignment etc. by writing the calibration value obtained by external calculation into them.

By using this calibration function, AK7455 can be used not only in the Shaft-End configuration (end of shaft) but also in the Off-Axis configuration (side of shaft).

The AK7455 is the zero-latency rotary angle sensor to follow rotation speed up to 25000rpm by Type2 tracking servo loop architecture. It is suitable for motor-controlled applications with an encoder. Also, the servo filter bandwidth can be extended to improve the tracking performance of acceleration and deceleration operations.

The AK7455 is equipped with an anomaly magnetic field detection function that judges the magnetic field from sources other than the sensor magnet and issues an alarm using the ERROR pin and register.

The AK7455 also has a function to dynamically reduce angular errors caused by anomaly magnetic fields.

Note1: This datasheet does not describe how to set up the INL error calibration, the anomaly magnetic field detection function, or the error reduction function due to anomaly magnetic fields. Please contact us for more information.

2. Applications

Motor Controlled Applications (Robot, Machine tools, Stepping motor, DC brushless motor, etc.)
Optical Encoder Replacement

3. Features

- 360° Contactless Absolute Angle Sensor
- Shaft-End (end of the shaft) and Off-Axis (side of the shaft) Configuration Available
- Operating Temperature: -40 to +125°C
- Supply Voltage: 3.0 to 5.5V
- Magnetic Field Range: 30 to 70mT (Shaft-End), 10 to 70mT (Off-Axis)
- Angle Resolution: 14bit
- Maximum Tracking Rotation Speed: 25000rpm
- Angle INL: $\pm 0.5^\circ$ (25°C, w/o calibration, Shaft-End), $\pm 0.1^\circ$ (after calibration, typical value)
- Output Delay: 1.2 μ s (ABZ Hysteresis "OFF" setting)
- Self-diagnostic Functions

- Low Magnetic Flux Density State Detection
- Tracking Lost State Detection
- Anomaly Magnetic Field Detection
- ☐ Interfaces
 - 4-wire Serial Interface (SPI): Absolute Angle Data & User Programming
 - ABZ Incremental Output
 - UVW Commutation Output
- ☐ User Programming Functions
 - Independently Settable Zero Point for ABZ (linked SPI absolute angle data) and UVW
 - Rotation Direction Setting: CCW / CW
 - ABZ Incremental Output Resolution Setting: 1 to 4096ppr
 - Z-phase Pulse Phase Setting: 4 Edges Selectable
 - Z-phase Pulse Width Setting: 1 to 16384LSB
 - UVW Commutation Output Resolution Setting: 2 to 64poles (1 to 32pole pairs)
 - Band Width Setting of Type2 Tracking Servo Loop Filter
 - Angle INL Error Calibration
 - Anomaly magnetic field detection
 - Function to reduce angular error due to anomaly magnetic field
 - X-Y, X-Z and Y-Z magnetic field detection
- ☐ Package
 - 24pin - QFN 4.0mm x 4.0mm x 0.85mm (typ)
- ☐ Environmental Friendly (RoHS Compliant)
 - Lead-free
 - Halogen-free

4. Diagram and Functional Descriptions

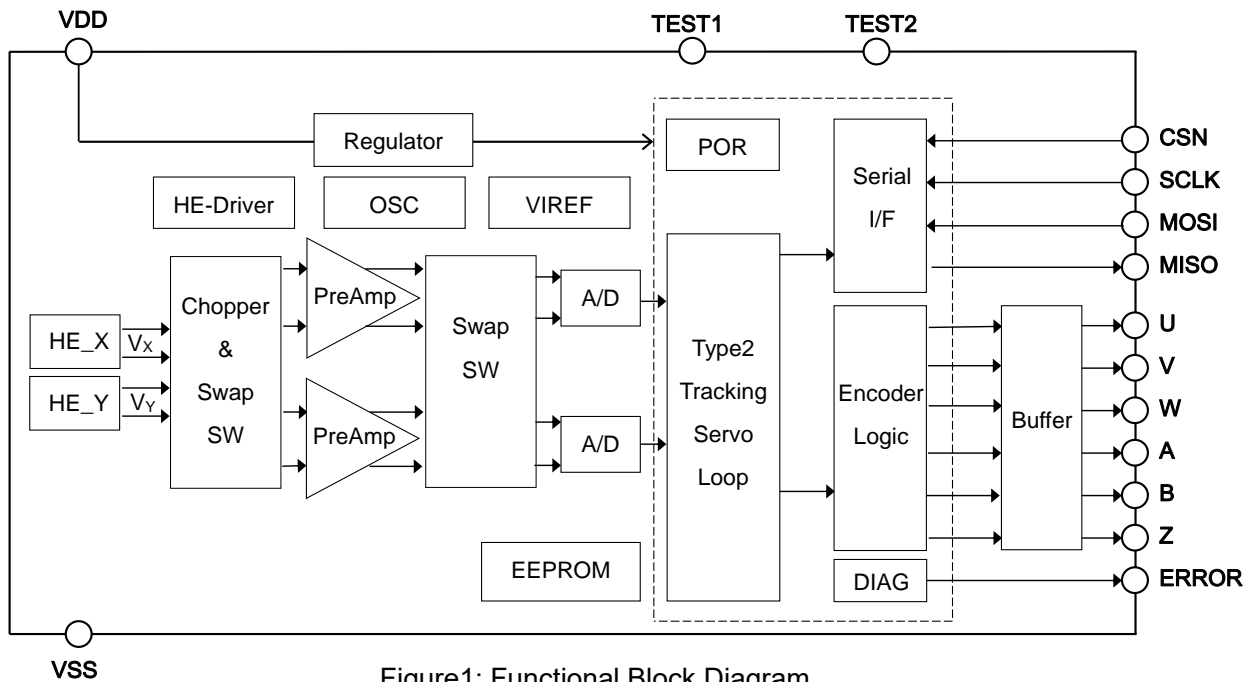
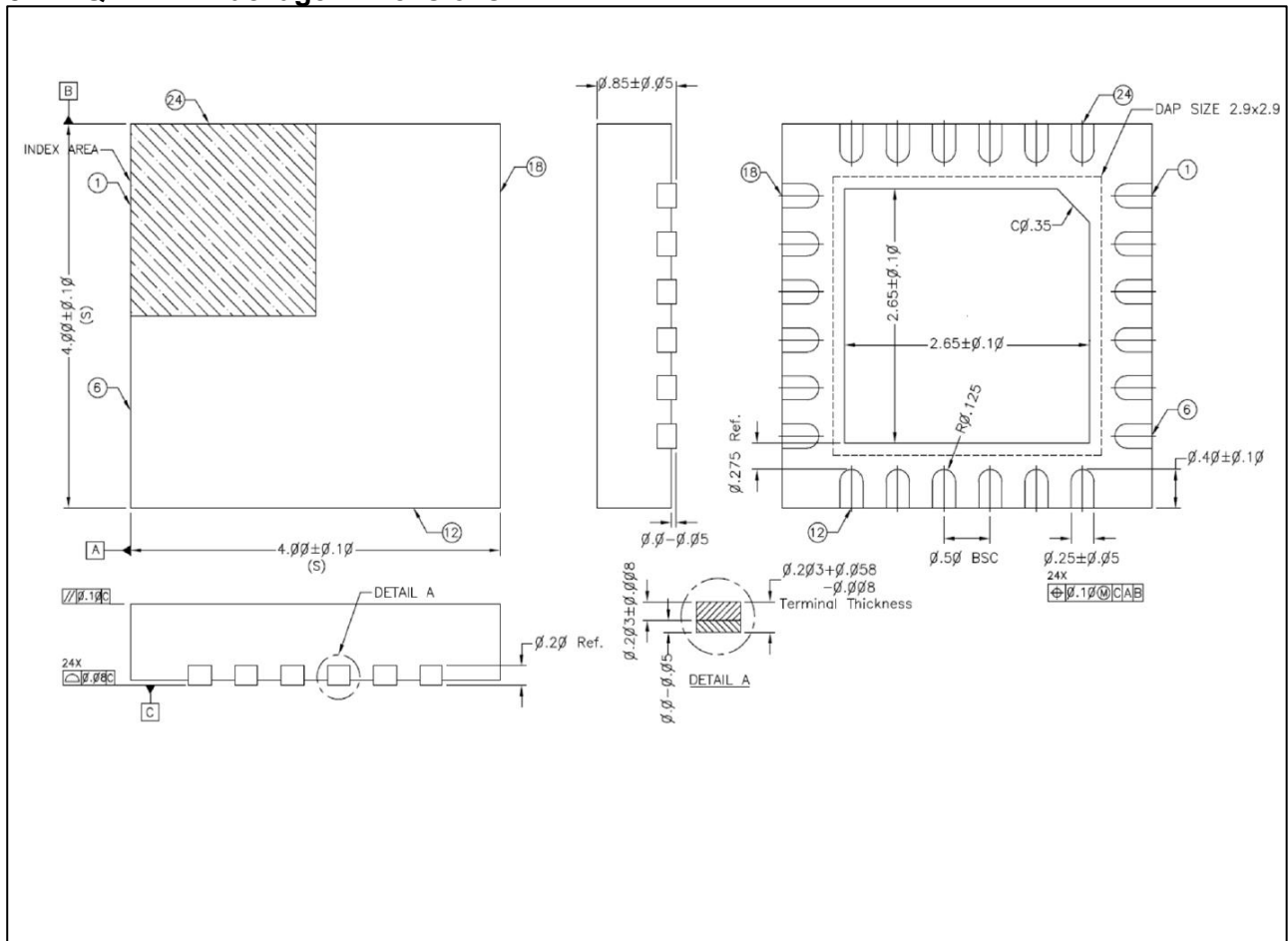


Figure1: Functional Block Diagram

5. Package Information

5.1. QFN24 – Package Dimensions



6. Pin Configuration and Functional Descriptions

No.	Pin Name	I/O	Type	Functional Descriptions
1	W	O	Digital	W-phase Output
2	V	O	Digital	V-phase Output
3	U	O	Digital	U-phase Output
4	MISO	O	Digital	Serial I/F Data Output
5	MOSI	I	Digital	Serial I/F Data Input
6	SCLK	I	Digital	Serial I/F Clock Input
7	CSN	I	Digital	Serial I/F Chip Select Input
8	NC	-	-	No Connection (Note2)
9	NC	-	-	No Connection (Note2)
10	NC	-	-	No Connection (Note2)
11	VDD	-	Power	Power Supply
12	TEST1	I	-	Test Pin (Note3)
13	TEST2	I	-	Test Pin (Note4)
14	VSS	-	Ground	Ground
15	ERROR	O	Digital	Error Output
16	Z	O	Digital	Z-phase Output
17	B	O	Digital	B-phase Output
18	A	O	Digital	A-phase Output
19	NC	-	-	No Connection (Note2)
20	NC	-	-	No Connection (Note2)
21	NC	-	-	No Connection (Note2)
22	NC	-	-	No Connection (Note2)
23	NC	-	-	No Connection (Note2)
24	NC	-	-	No Connection (Note2)
TAB	TAB	-	-	Back Tab (Note5)

Note2: NC pins must be open.

Note3: TEST1 pin must be open.

Note4: TEST2 pin must be connected to VSS.

Note5: Back Tab must be open.

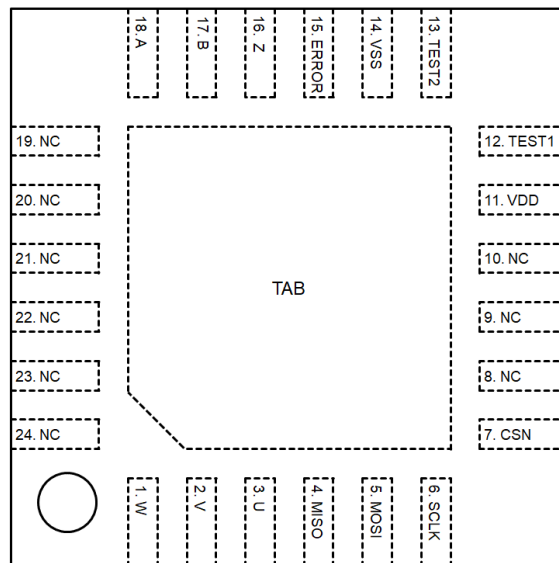


Figure2: Pin Configuration (Top view)

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