



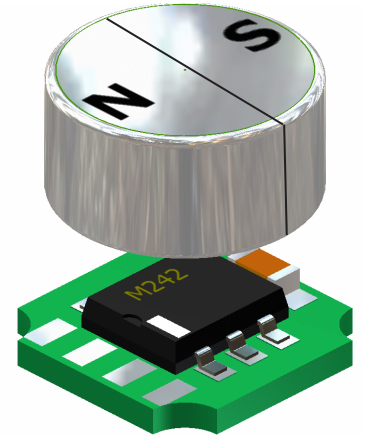
AKM EM-3242 360 Deg Angle Position Ref Design with “In Range” Detection and Power Down RD102-EM3242

The RD102-EM3242 is a reference design for the AKM EM-3242 Non-Contact Angle Position Sensing IC. The EM-3242 senses the angle of magnetic field component in the top plane of the device package. The EM-3242 provides an analog output voltage of 10% to 90% of the supply voltage for a mechanical angle range of 360 degrees of rotation. The EM-3242 has two operating modes. One with the “In Range” detector enabled and one with the “In Range” detector disabled. The “In Range” detector includes internal circuitry which causes the output voltage to drop to 0V whenever the magnetic field level at the EM-3242 is greater than 60mT or less than 10mT.

This reference design illustrates the operating mode which has the “In-Range” detector enabled. Please note that the PDN (Power Down) function is also enabled in this mode.

GMW offers an engineering development kit that can be used to evaluate this reference design. The P/N is AN_133KIT

RD101-EM3242 details the design for a angle sensor that has the “In Range” detector enabled and the PDN (Power Down) enabled. The engineering development kit for RD101-EM3242 is AN_134KIT.



EM-3242 on PCB with 0.250” dia. X 0.150 thick SmCo24 magnet (55B0081).

FEATURES

- 360 Degree Non-Contact Magnetic Angle Position Sensing
- Analog Output 10% to 90% of VDD
- Nonlinearity less than 3.5 deg at 3V
- Magnetic to EM-3242 separation of 0.100” to 0.250”
- Tolerant of mechanical misalignment
- Expanded Magnet to IC separation with increased non-linearity
- Out of Range Detection (Faults to 0V when Magnetic Field is >60mT or <10mT.
- Power Down (PDN) option reduces current draw to <10uA.

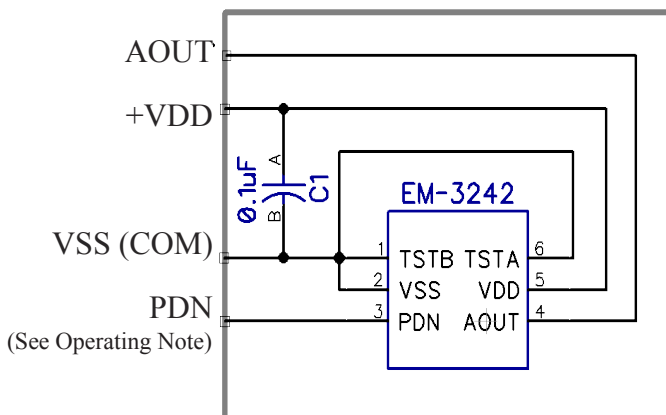
- Only 1 external component required (0.1uF)
- Less than 10mA operating current
- Ratio-metric output
- Very small 6 pin IC package (3.6mm x 4.2mm).
- Circuitry fits on a 0.25” x 0.25” PCB.
- 10 Bit Resolution (0.36 deg)
- Fast update speed (40uS/update)

Reference Documents

- EM-3242 Specification Sheet - July, 2008
- 55B0082 Spec Sheet (0.25”dia. x 0.15”T SmCo24 Magnet)
- 55B0081 Spec Sheet (0.15”dia. x 0.15”T SmCo24 Magnet)
- 55C0126 Spec Sheet (0.25”Sq. x 0.10”T SmCo24 Magnet)
- AN_134KIT- Eng Development Kit
- RD101-EM3242 Ref Design for Angle sensing without “In Range” Detector

Magnetic flux density (Magnetic Field) units of Gauss and Tesla

- 1G=100uT or 0.1mT
- 10G =1mT
- 100G =10mT



Schematic Diagram

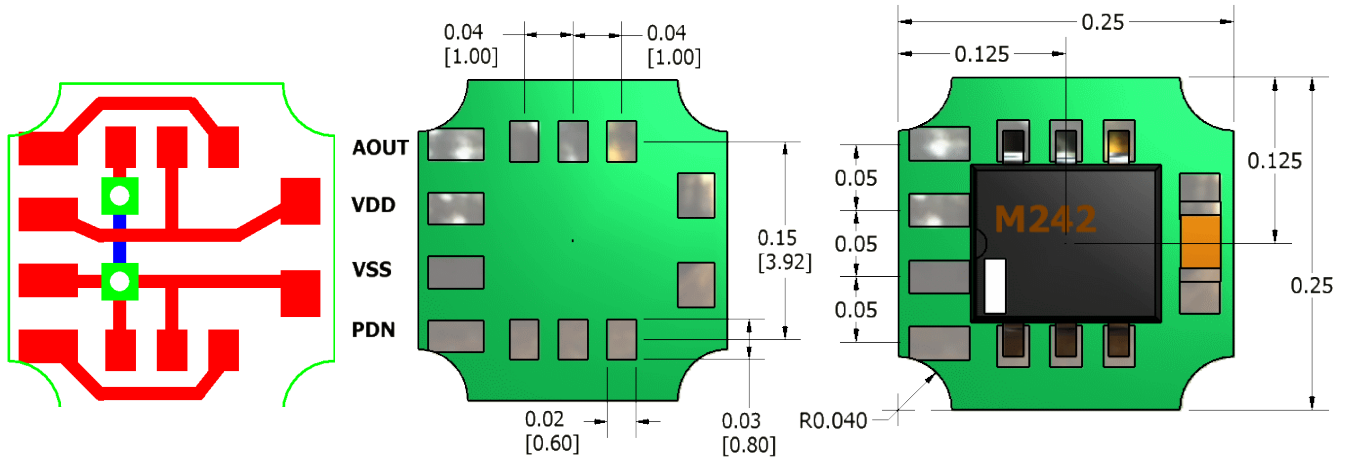
Bill of Material

- IC-1 EM-3242 IC
- C1- 0.1uF Ceramic cap-0603 SMD +/-10%
- PCB FR-4, 0.8mm thick, 0.5 oz copper
- 55B0082 Cylindrical Magnet or
- 55B0081 Cylindrical Magnet or
- 55C0126 Square Magnet

Operating Note:

Power Down (PDN) is enabled when PDN is tied to VSS (COM). Tie PDN to +VDD activate the sensor for normal operation

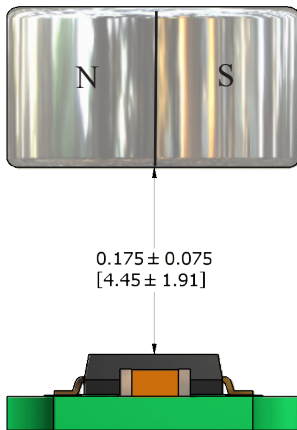
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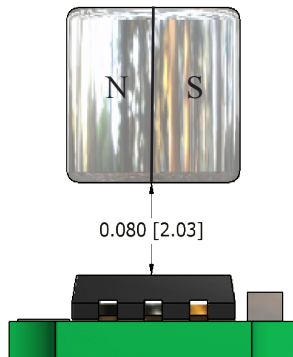
PCB Artwork

EM-3242 Solder PAD Recommendation

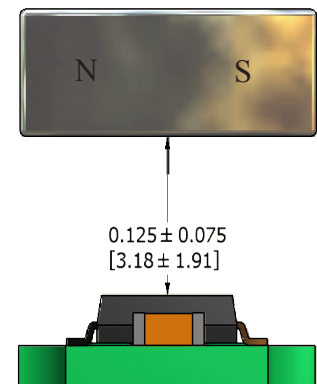
PCB Outline Diagram



Air Gap Operating Range for the 55B0082 Cylindrical Magnet



Air Gap Operating Range for the 55B0081 Cylindrical Magnet



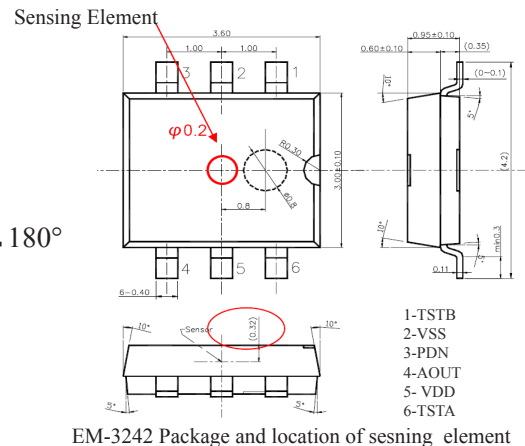
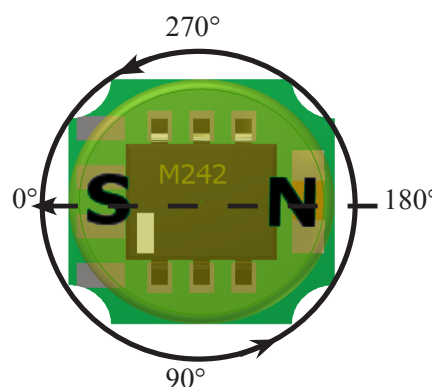
Air Gap Operating Range for the 55C0126 Square Magnet

Air-Gap ranges to produce specified linear output. See graph on page 4 for expanded ranges

Magnet Orientation

Output increases as magnet is rotated CounterClockwise. See output curve, next page

Zero Degrees occurs when the South Pole of the magnet is in line with pin and 6 of the IC.

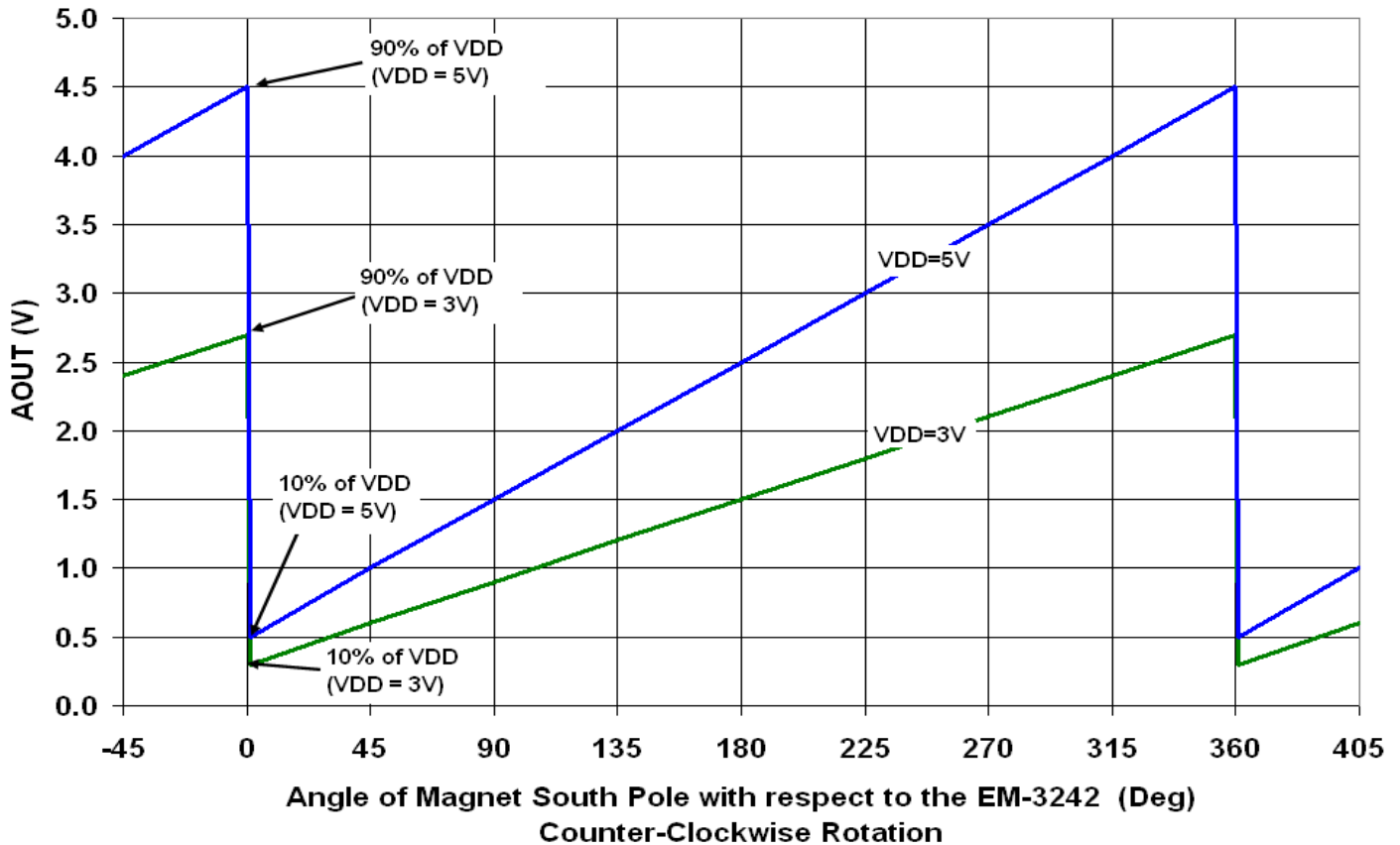


EM-3242 Package and location of sensing element



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AOUT vs POSITION OF SOUTH POLE OF MAGNET



360 to 0 Degree Transition

When the Angle of rotation approaches the 360 degree position, the output will approach 90% of the supply voltage and then abruptly change to 10% of VDD and then start increasing again as the angle increases. This transition can be as wide as 0.5deg. If the position of the magnet is held steady at a point within the 0.5 deg. range, there is a possibility that the output will randomly switch between the 90% level and the 10% level. Both levels represent the same angle of 0 deg. If the output is filtered with a low pass filter, the average voltage output could be approximately 50% of VDD, thus creating an error in the reading. This can be avoided by not using a low pass filter. If a uP is used to sample the output, it can simply register a 10%VDD reading and a 90%VDD reading as the same angle (zero degrees).

Non-Linearity Specifications.

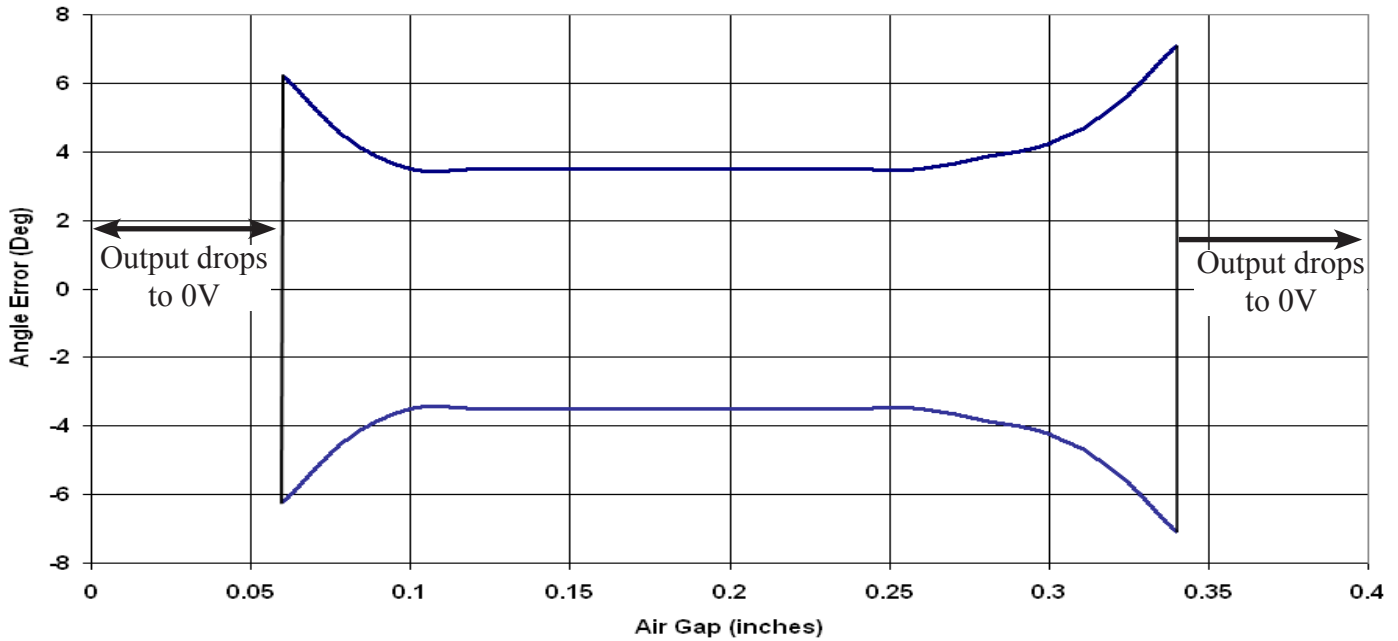
The EM-3242 is specified to operate within +/-3.5 degrees of non-linearity when the supply is 3V and +/-6 degrees when the supply voltage is 5V over the magnetic field range of 20mT to 50mT. With the "In Range" detector enabled, as in this case, the sensor will continue operate normally until the magnetic field strength at the sensor either exceeds 60mT or drops below 10mT. When these limits are exceeded, the output of the EM-3242 will drop to 0.2V or less. The following graphs show the relationship between the non-linearity range and the air gap between the magnet and sensor for the 55B0082 magnet.

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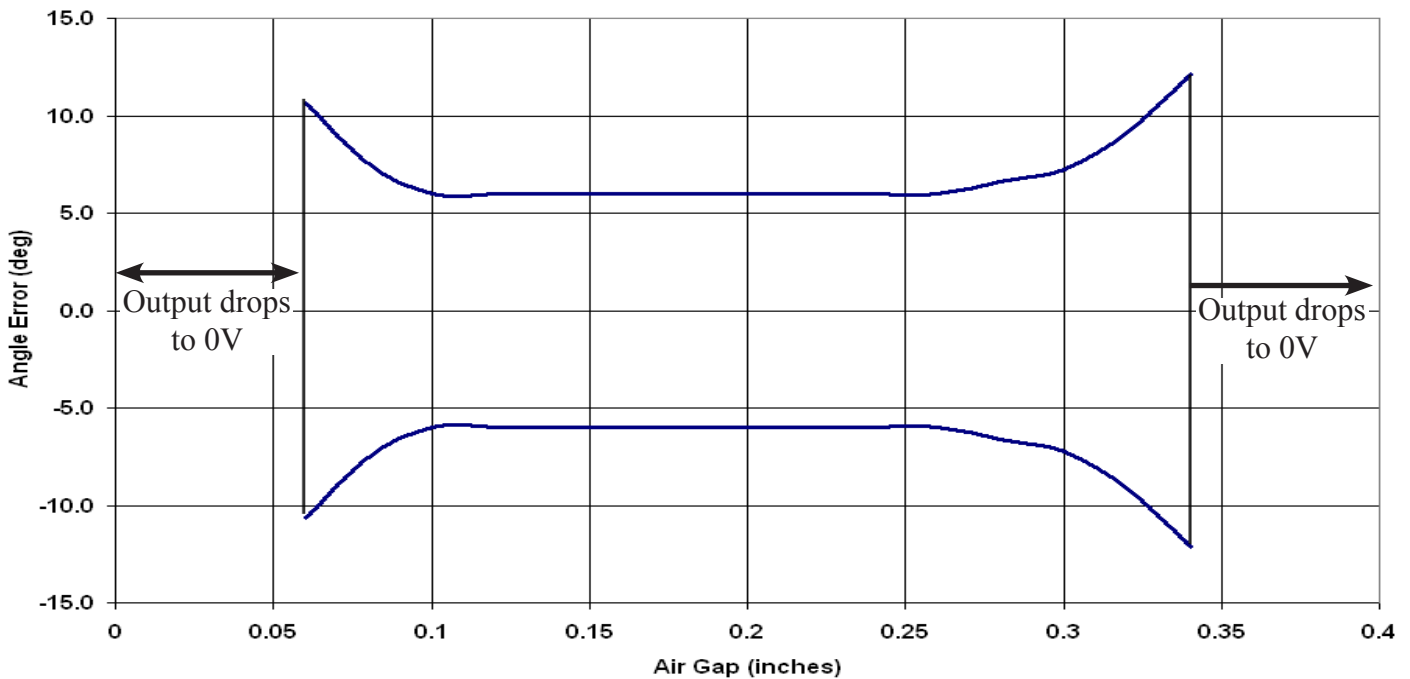


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Limited Range Operating Mode
Angle Error vs Air Gap for the 55B0082 Magnet
VDD = 3.0V



Limited Range Operating Mode
Angle Error vs Air Gap for the 55B0082 Magnet
VDD = 5.0V



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