

ZX-MAGNETIC

Magnetic field sensor board

This sensor board use UGN3503 a 3 A Hall-effect sensor which accurately tracks extremely small changes in magnetic flux density—changes generally too small to operate Hall-effect switches. Output is DC voltage relative magnetic filed density.

If no magnetic field or 0 Gauss, output voltage is middle point at 2.5V.

In case magnetic field direction is out from the point at back package of UGN3503, the voltage output from its output will increase. In case the magnetic field direction is rush to the point at the back package of UGN3503, the voltage output from its will decrease.

The changing ratio is 1.3V per 1 Gauss. The voltage output can calculate following this formula :

$$V_{out} = 2.5 + (0.0013 \times \text{Magnetic field densitiy in Gauss unit})$$

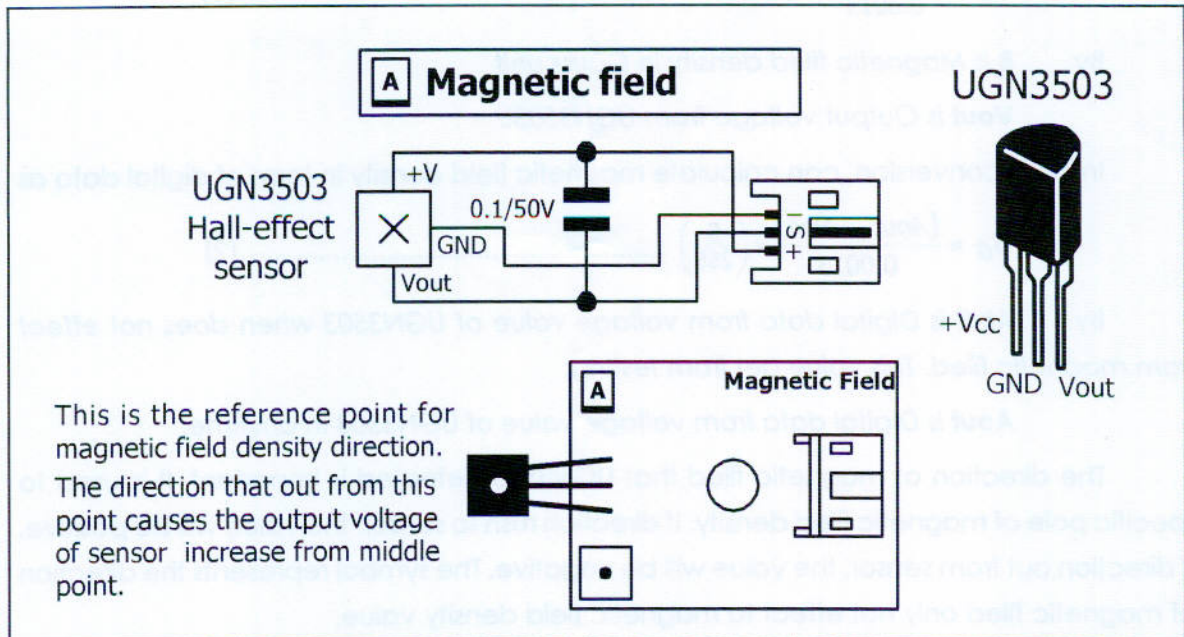


Figure 1 The ZX-MAGNETIC schematic diagram and operation

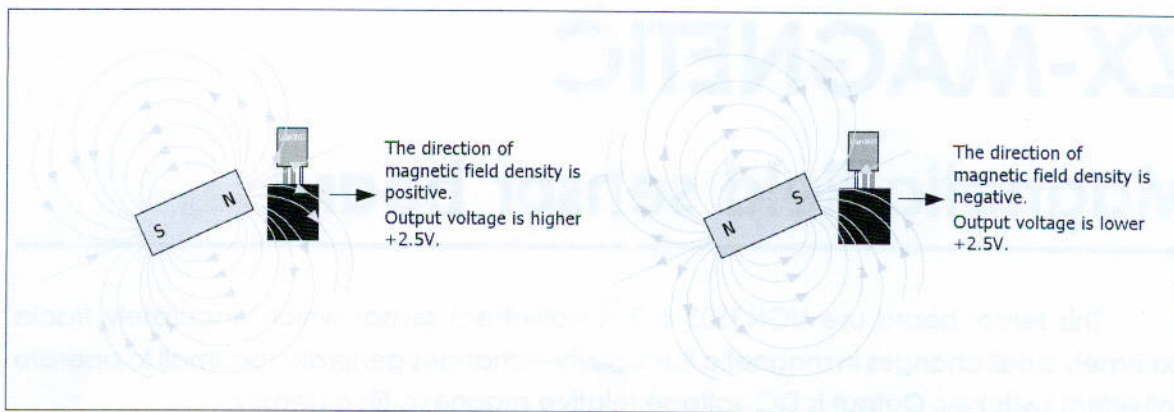


Figure 2 Shows the operation of UGN3503 when detect the different direction of magnetic field density.

Calculation of UGN3503U

Refer the output voltage of UGN3503, can calculate to find the magnetic field density. The result is linear approximation. The reference is magnetic field density 0 G (Gauss) equal 2.5Vdc. Every voltage changing at 1.3mV means the magnetic field density change 1 G. Summary of this relation can show as :

$$B_G \approx \frac{V_{out} - 2.5}{0.0013} \dots\dots\dots (1)$$

By **B** is Magnetic field density in Gauss unit

Vout is Output voltage from UGN3503U

In data conversion, can calculate magnetic field density in term of digital data as

$$B_G \approx \frac{(A_{out} - A_{init})}{0.0013} \times \left(\frac{5}{255}\right) \dots\dots\dots (2)$$

By **Ainit** is Digital data from voltage value of UGN3503 when does not effect from magnetic field. This value get from testing.

Aout is Digital data from voltage value of UGN3503 in anytime.

The direction of magnetic field that UGN3503 detected is important. It is used to specific pole of magnetic field density. If direction rush to sensor, the value will be positive. If direction out from sensor, the value will be negative. The symbol represents the direction of magnetic field only not effect to magnetic field density value.

If bring a permanent magnet close up to front of UGN3503, read the value from conversion as positive. It means pole of magnet near sensor is north pole. Otherwise, the value is negative. It means pole of magnet near sensor is south pole.