



Hall-Effect Sensors in Roller Shutters

Overview

Micronas pioneered CMOS-based Hall-effect sensors and today offers the world's broadest selection of Hall-effect sensors. Based on innovative mixed-signal circuit architectures and built in a proprietary CMOS technology, these sensors are the basis for a compact, highly reliable and cost-effective solution for the detection of position, speed, rotation, pressure, level, fluid flow, and current.

The Hall-effect describes the phenomena where a magnetic field induces a voltage difference in a conductor. Therefore, these sensors are able to sense a change in a magnetic field without requiring physical contact with the object in motion. This contactless sensing results in higher system reliability, robustness, and longer system life. Further, such systems are less sensitive to environmental influences such as dust, dirt, mud, and humidity. These characteristics have made Hall-effect sensing the preferred solution for position and rotation speed sensing, replacing traditional electro-mechanical and optical solutions.

Micronas offers dedicated sensor families tailored to specific application needs. The switch families, which produce binary output, differ in temperature range and tolerance (HAL 1xy, HAL 2xy, HAL 5xy), allowing customers to choose the right fit for their systems price-performance requirements. More advanced switches, such as double-plate sensing (HAL 7xy) and high-end programmability (HAL 10xy) are also available.

Linear Hall sensors, which produce an output voltage, that is proportional to the sensed magnetic field, vary in complexity from pre-programmed (HAL 182x), user-programmable (HAL 8xy), to smart sensors which include protocol specific interfaces (HAL 28xy). The newest generation of Hall devices is capable of direct angle measurement up to 360° (HAL 36xy).

This system solution describes a common household and office application that can be implemented cost-effectively with Hall technology. Rolling shutters and blinds are a convenient way to control the amount of light getting into a room or office. A Hall-based implementation results in a robust, safe, compact and cost-effective solution enabling system realization at a cost point that enables wide deployment.

Roller Shutter Motor Systems (Position and direction detection)

More and more home automation systems require the detection of end-positions, rotation speed, and direction detection. One example are roller shutter (tubular) motors which are popular systems for using Hall sensors.

Functional principle of end-position detection: A plastic ring is connected with the rotating part of a tubular motor moving the roller shutter. Cheap bar magnets are attached to the plastic ring. Depending on the resolution requirements the number of magnets can vary between one and four. Alternatively, a multipole ring magnet could be used.

The rotating magnet(s) switches the Hall sensor "ON" and "OFF" producing a square wave output. By counting the switch edges and knowing the length of the roller shutter, it is easy to check if the shutter has reached its endposition (completely open or closed).

Additionally, it is also possible to detect the blocking of the shutter by using a second sensor together with a multipole ring directly at the motor axis. In case that the shutter is blocked by a barrier, the rotation speed of the motor will deviate from the speed of the shutter.

Micronas Hall sensors (HAL 1xy) with a single Hall plate are especially suitable for this application.

Detailed information on the HAL 1xy family can be found in the data sheet, which can be retrieved via <http://www.micronas.com/hal1xy>.

Permanent ferrite magnets or plastic bound ferrites are preferred for this roller shutter application. These types of magnets are cost-effective and can be produced in various shapes. An additional advantage is the high temperature stability and their resistance to corrosion. Optionally, plastic bound ferrite can be directly extruded into the plastic paddle wheel.

The HAL 1xy family offers following important features for this application:

- ◆ Small SMD SOT89 or TO92 package
- ◆ Wide temperature range from $-20\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ or $0\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
- ◆ Temperature-compensated Hall plate
- ◆ Unipolar or latching sensor version
- ◆ Supply voltage from $+3.8\text{ V}$ up to $+24\text{ V}$
- ◆ Typ. 3 mA current consumption
- ◆ Open-drain output transistor
- ◆ Different sensitivities of magnetic flux density available (low, medium, high)
- ◆ Maximum switching frequency $\sim 10\text{ kHz}$

Samples of the HAL 1xy family can be ordered via our distribution network or directly via our [webSHOP](http://www.micronas.com/webshop) (www.micronas.com/webshop).

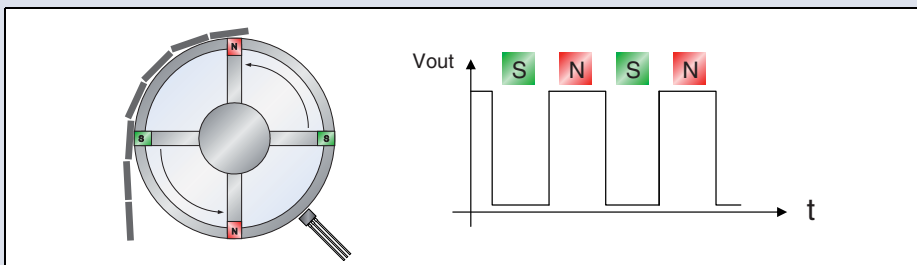


Fig. 1: Application with four magnets and latching Hall sensor

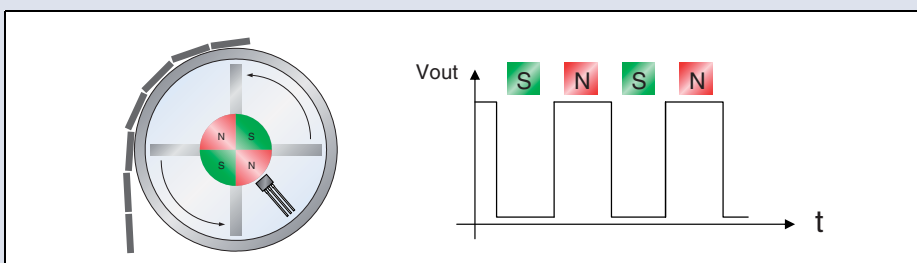


Fig. 2: Application with two magnets and latching Hall sensor

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