

# HAL 1xy

April/2009



## HAL<sup>®</sup> 1xy Low-Cost Hall-Effect Sensor Family

The HAL 1xy Hall switch family is designed for home appliances and industrial applications. The sensors are produced in CMOS technology and include a temperature-compensated Hall plate with active offset compensation, a comparator, and an open-drain output transistor.

The comparator compares the actual magnetic flux through the Hall plate (Hall voltage) with the fixed reference values (switching points). Accordingly, the output transistor is switched on or off.

The active offset compensation leads to magnetic parameters which are robust against mechanical stress effects. In addition, the magnetic characteristics are constant in the full supply voltage and temperature range.

The HAL 1xy family is available in the SOT89B SMD package and in the leaded TO92UA package.

### Features

- ◆ Temperature ranges
  - C (Commercial,  $T_J = 0\text{ °C to }+85\text{ °C}$ )
  - I (Industrial,  $T_J = 20\text{ °C to }+125\text{ °C}$ )
- ◆ Operates from 3.8 V to 24 V supply voltage
- ◆ Operates with static magnetic fields and dynamic magnetic fields up to 10 kHz
- ◆ Overvoltage protection at all pins
- ◆ Reverse-voltage protection at  $V_{DD}$  pin
- ◆ Magnetic characteristics are robust against mechanical stress effects
- ◆ Short-circuit protected open-drain output by thermal shut down
- ◆ Constant switching points over a wide supply voltage and temperature range
- ◆ The decrease of magnetic flux density caused by rising temperature in the sensor system is compensated by a built-in negative temperature coefficient of the magnetic characteristics
- ◆ High temperature stability for home appliances and industrial applications
- ◆ High ESD rating

### Major Applications

The HAL 1xy is the optimal system solution for application fields, such as:

- ◆ White goods
  - selector switches
  - door lock detection
  - RPM detection
- ◆ Power tools
  - speed control
  - direction switch
- ◆ Home automation
  - garage openers
  - door openers
- ◆ Industrial applications
  - Endposition detection
  - RPM measurement of motors
  - Brushless DC motors
  - RPM measurements in flow meters
  - Replacement of micro switches

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## Family Overview

Type	Switching Behavior	Sensitivity
HAL 101	unipolar	low
HAL 102	latching	high
HAL 103	latching	medium
HAL 104	latching	low
HAL 106	unipolar	high
HAL 107	unipolar	low
HAL 108	unipolar	medium
HAL 109	unipolar	high

## System Architecture

The Hall-effect sensor is a monolithic integrated circuit that switches in response to magnetic fields. If a magnetic field with flux lines perpendicular to the sensitive area is applied to the sensor, the biased Hall plate forces a Hall voltage proportional to this field. The Hall voltage is compared with the actual threshold level in the comparator.

The temperature-dependent bias is used to compensate the decreasing induction of magnets at higher temperatures. If the magnetic field exceeds the threshold levels, the open-drain output switches to the appropriate state. The built-in hysteresis eliminates oscillation and provides switching behavior of output without bouncing.

Magnetic offset caused by mechanical stress is compensated for by using the "switching offset compensation technique".

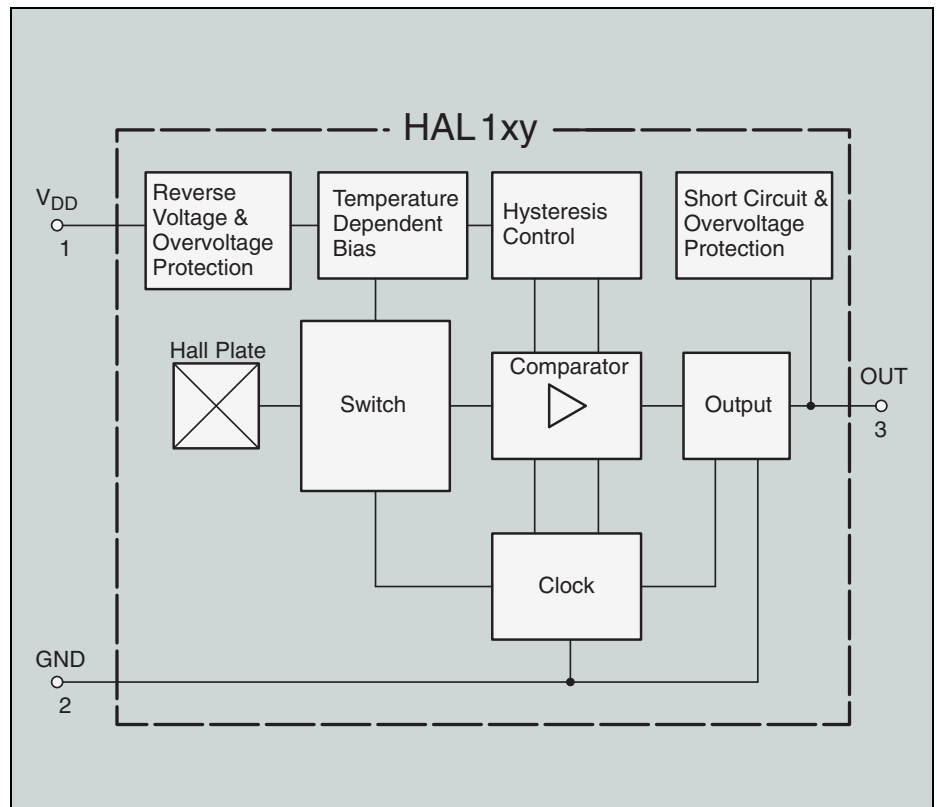


Fig. 1: Block diagram of the HAL 1xy

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Edition April 14, 2009; Order No. PI000134\_001EN