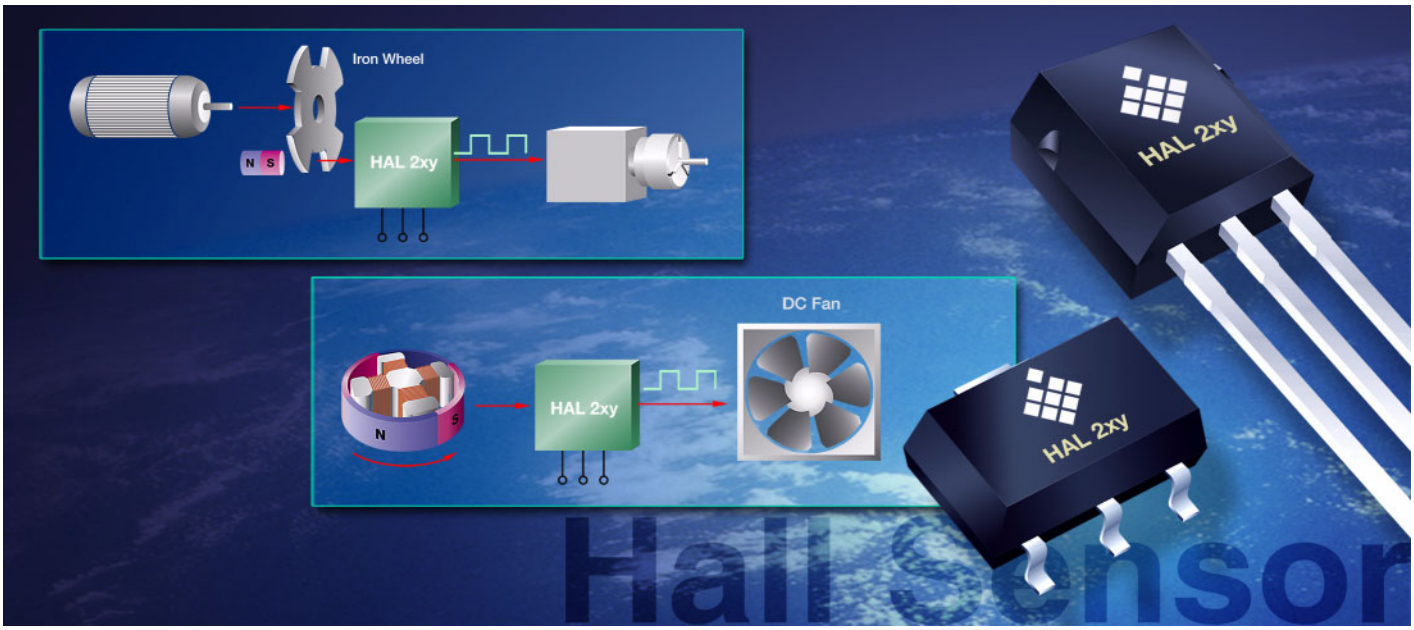
HAL 2xy

May/2006



HAL® 2xy
Low-Cost Hall-Effect Sensor Family

The HAL 2xy Hall switch family is produced in CMOS technology. The sensors 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 sensors are designed for industrial and automotive applications and operate with supply voltages from 3.8 V to 24 V in the ambient temperature range from –40 °C up to 125 °C.

The HAL 2xy family is available in the SMD package SOT-89B-3 and in the leaded versions TO-92UA-5 and TO-92UA-6.

Features

- 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 automotive or industrial applications
- High ESD rating

Major Applications

The HAL 2xy is the optimal system solution for applications, such as:

- Endposition detection
- RPM measurement of motors in various applications, such as power window
- Brushless DC motors
- RPM measurements in flow meters
- Replacement of micro switches

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Available Types and Switching Behavior

Sensor Switching Type	Parameter T_J	On point B_{ON} Typ.	Off point B_{OFF} Typ.	Hysteresis B_{HYS} Typ.
HAL201	–40 °C	34.5	24	10.5
unipolar	25 °C	34.5	24	10.5
	140 °C	34.5	24	10.5
HAL202	–40 °C	2.8	–2.8	5.5
latching	25 °C	2.6	–2.6	5.5
	140 °C	2.4	–2.4	5
HAL203	–40 °C	8.4	–8.6	17
latching	25 °C	7.6	–7.6	15
	140 °C	6.7	–6.4	13
HAL204	–40 °C	15.8	–15.8	31.6
latching	25 °C	14	–14	28
	140 °C	10	–10	20

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 increases the supply voltage of the Hall plates and adjusts the switching points to 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”. Therefore, an internal oscillator provides a two phase clock. The Hall voltage is sampled at the end of the first phase. At the end of the second phase, both sampled and actual Hall voltages are averaged and compared with the actual switching point.

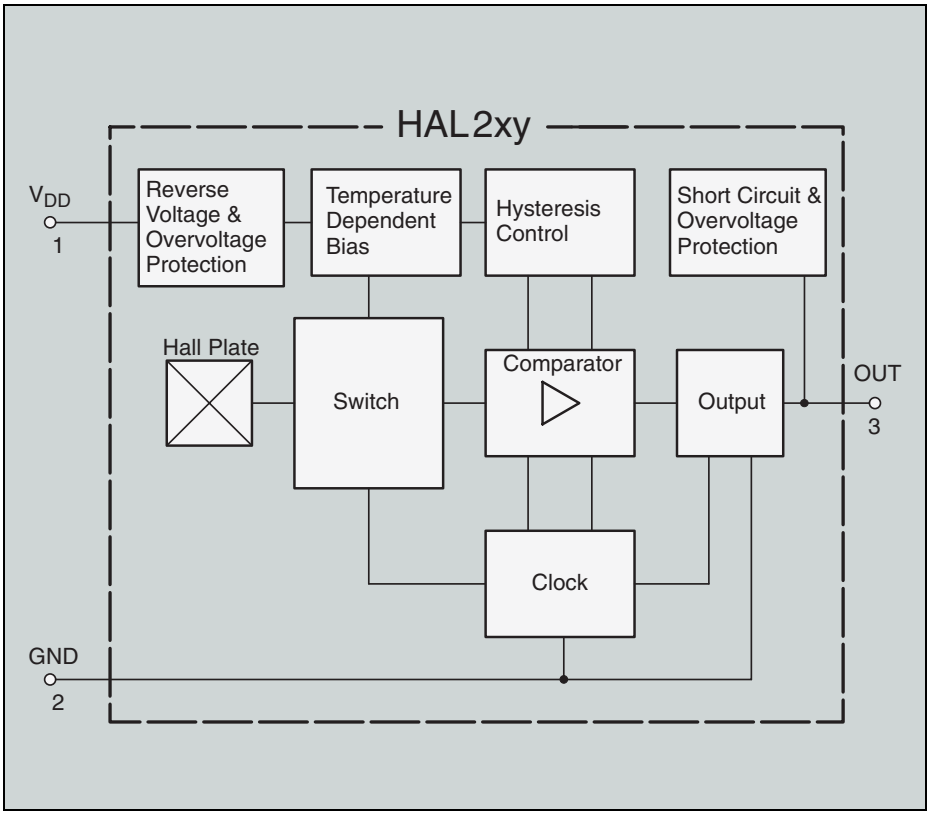

Fig. 1: Block diagram of the HAL 2xy

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