



3D HAL Technology **ASIL** ready



HAL 13xy

Dual-Output 3D Hall-Effect Switch



HAL 13xy family, is a factory-programmable Hall-effect switch sensor designed for speed and direction detection in automotive and industrial applications. Leveraging TDK-Micronas' proven 3D HAL technology, HAL 13xy features three orthogonal Hall elements (X, Y, Z) arranged in a pixel cell, providing 90° phase separation (quadrature signal) that is inherently independent of magnet pole spacing and air gap. This design enables the simultaneous measurement of two magnetic-field components, offering manufacturers maximum flexibility in sensor and magnet placement. HAL 13xy delivers two independent open-drain outputs, which can be configured for quadrature speed/speed or speed/direction signals. This flexible output configuration supports compact electric motor control in applications that require precise, reliable, and space-saving sensing technology. With its robust design and versatile outputs, HAL 13xy helps enable smooth motion control, high safety standards, and enhanced user comfort.

All CMOS wafer processing is done in TDK-Micronas' facilities to ensure best quality control and highest flexibility.

HAL 13xy fulfills the latest quality and functional safety standards as AEC-Q100 qualified and ISO 26262 ASIL B ready device, enabling our customers to target even the most safety-critical applications.

With different product type versions, the HAL 13xy switch family serves a broad variety of automotive and industrial applications under harsh temperature conditions.

Features

- Dual-output switch for simultaneous measurement of two orthogonal magnetic-field components
- Flexible sensor and magnet placement
- Configurable for quadrature (speed/speed) or speed/direction outputs
- SEooC ASIL B-ready according to ISO 26262
- Continuous built-in self-test (BIST) and short-circuit/thermal protection
- Low current consumption of 3 mA
- Wide supply voltage range from 3 V to 24 V
- 40 V load dump robustness and -18 V reverse-voltage protection
- Compact 5-pin SOT23 package
- High HBM ESD performance of ± 4 kV

- High EMC performance compliant with ISO and IEC standards
- Operating with static and dynamic magnetic fields up to 40 kHz
- AEC-Q100 qualification
- Wide ambient temperature range: -40°C to +150°C
- High robustness of magnetic characteristics against mechanical stress
- Broad family with various magnetic parameters and output behavior.

Major Applications

HAL 13xy family is the optimal system solution for key applications such as:

- Window lifters with anti-pitch functionality
- Tailgate motors
- Seat / Steering column motors
- Steering turn-count sensing
- Sunroof motors
- Valve position

Available Types

| Product type | Bon typ [mT] | Boff typ [mT] | Output behavior | TC [ppm/K] | Active pole | Output 1 | Output 2 | Sensitive axis |
|--------------|--------------|---------------|-----------------|------------|-------------|----------|-----------|----------------|
| HAL 1301 | 1.2 | -1.2 | Latch | 0 | South | Speed | Speed | X, Y |
| HAL 1302 | 2.5 | -2.5 | Latch | 0 | South | Speed | Direction | Z, X |
| HAL 1303 | 3.0 | -3.0 | Latch | -2000 | South | Speed | Speed | Z, X |
| HAL 1304 | 7.5 | -7.5 | Latch | 0 | South | Speed | Speed | Z, Y |
| HAL 1305 | 1.7 | -1.7 | Latch | 0 | South | Speed | Speed | Z, Y |
| HAL 1306 | 9.0 | -9.0 | Latch | -1200 | South | Speed | Speed | X, Y |
| HAL 1307 | 7.5 | -7.5 | Latch | 0 | South | Speed | Direction | Z, X |
| HAL 1308 | 1.7 | -1.7 | Latch | 0 | South </tr | | | |

System Architecture

HAL 13xy sensors are monolithic integrated circuits which switch 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 defined threshold level in the comparator (logic). If the magnetic field exceeds the threshold levels, the output stage (open-drain output) is switched to the appropriate state.

The built-in hysteresis eliminates oscillation and provides switching behavior of the output without toggling. Magnetic offset caused by mechanical stress is compensated by using the "switching offset compensation technique".

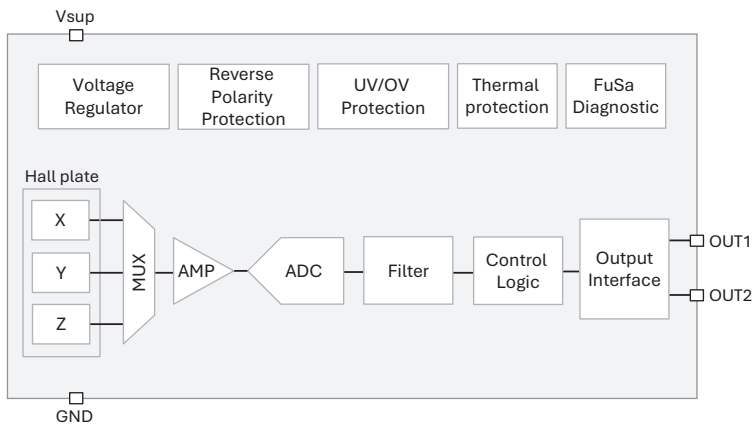


Fig. 1: Block diagram of the HAL 13xy



Fig. 2: Application: Expansion valve

TDK-Micronas GmbH

Hans-Bunte-Strasse 19 | D-79108 Freiburg (Germany) | P.O. Box 840 | D-79008 Freiburg (Germany) | Tel. +49-761-517-0
Worldwide sales contact: mic-sales@tdk.com

www.micronas.tdk.com

All information and data contained in this product information are without any commitment, are not to be considered as an offer for conclusion of a contract, nor shall they be construed as to create any liability. Product or development sample availability and delivery are exclusively subject to our respective order confirmation form. By this publication, TDK-Micronas GmbH does not assume responsibility for patent infringements or other rights of third parties which may result from its use.

No part of this publication may be reproduced, photocopied, stored on a retrieval system, or transmitted without the express written consent of TDK-Micronas GmbH.