

HAR 379x

June/2018

Update May 2021: All members of the HAL 37xy family are now defined as SEooC (Safety Element out of Context) ASIL-B ready, according to ISO 26262. ASIL-ready



HAR 379x Programmable Dual-Die 2D Position Sensor Family with Arbitrary Output Function

HAR 379x is a new member of the dual-die family HAR 37xy based on the HAL 37xy using the proprietary Micronas 3D HAL[®] technology. It is available in the same SOIC8 package as the HAL 37xy. Each sensor provides true redundancy as it consists of two independent stacked dies in a single package. The stacked-die architecture ensures that both dies sense the same magnetic field position, thus generating synchronous measurement outputs.

This new family member is focused on digital interfaces and support of safety-critical applications according to ISO 26262 rules. HAR 379x features digital output formats like PWM and SENT (according to SAE-J2716 release 2016). The digital output format is customer programmable. The PWM outputs are configurable with frequencies between 0.2 kHz and 2 kHz with up to 12 bit resolution. The SENT interface is flexible configurable and supports various tick times between 0.5 μs and 4.25 μs as well as several frame formats, like secure sensor information, etc.

One key feature is the possibility to transmit the calculated angle (position) information together with the magnetic-field amplitude in one SENT frame. This feature enables the development of rotary knobs with push function.

Conventional planar Hall technology is only sensitive to the magnetic field orthogonal to the chip surface. In addition, HAR 379x is also sensitive to magnetic fields applied in parallel to the chip surface.

The sensor cell can measure three magnetic field components BX, BY and BZ. This enables a set of applications for position detection, like wide distance, angle or through-shaft angular measurements.

HAR 379x is an ISO 26262 ready¹⁾ sensor. (SPFM > 90%, LFM > 60%)

The devices are designed for automotive and industrial applications and operate with ambient temperature range -40 °C up to 150 °C.

The HAR 379x family is available in a very small eight-pin SOIC8 package.

Features for each Die

- ◆ Angular and position measurement extremely robust against temperature and stress influence
- ◆ Customer-selectable PWM or SENT output
- ◆ 0.2 kHz to 2 kHz PWM (up to 12 bit) or 12 bit SENT
- ◆ Push-pull or open-drain output
- ◆ SENT according to SAE J2716 rev. 4
- ◆ Support of three different SENT frames
 - H.1: Two 12 bit fast channels (position & temperature or magnetic amplitude)
 - H.2: 12 bit fast channel
 - H.4: 12 bit secure single sensor
- ◆ Programmable arbitrary output characteristic with up to 33 setpoints
- ◆ Operates from -40 °C ...150 °C ambient temperature
- ◆ Programming via the sensor's output pin
- ◆ Second-order temperature-dependent offset of signal path programmable

¹⁾ For ISO 26262 ready sensors, proven-in-use arguments and functional safety analysis reports like FMECA and/or DFA can be provided to design them into ISO 26262 applications.

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Major Applications

Due to true redundancy, HAR 379x can address safety-critical applications according to ISO 26262 rules:

- ◆ Linear movement measurements in dual-clutch transmissions, engine stroke sensors, clutch pedal, as well as cylinder and valve position measurements
- ◆ Rotary position measurement in gear selectors, rotary selectors with push-function, rear-axis steering, etc.

Development Tools

Each die can be programmed during the final manufacturing process by adjusting the output signals directly to the input signal. With this calibration procedure, the tolerances of the sensor, the magnet, and the mechanical positioning can be compensated in the final assembly.

Micronas offers an easy-to-use evaluation kit for engineering:

- ◆ Micronas programmer board (TDK-MSP V1.0)
- ◆ USB programming kit
- ◆ LabVIEW™ programming software for Windows® including Sub VIs

System Architecture

The sensors include two vertical and one horizontal Hall plate with spinning-current offset compensation for the detection of X, Y, or Z magnetic field components, a signal processor for calculation and signal conditioning of two magnetic field components, protection devices, an PWM or SENT output.

Available Types and Behavior

Type	Output Format	Detectable Field Component
HAR 3795	PWM/SENT	B _X and B _Y
HAR 3796	PWM/SENT	B _X and B _Y
HAR 3797	PWM/SENT	B _Y and B _Z

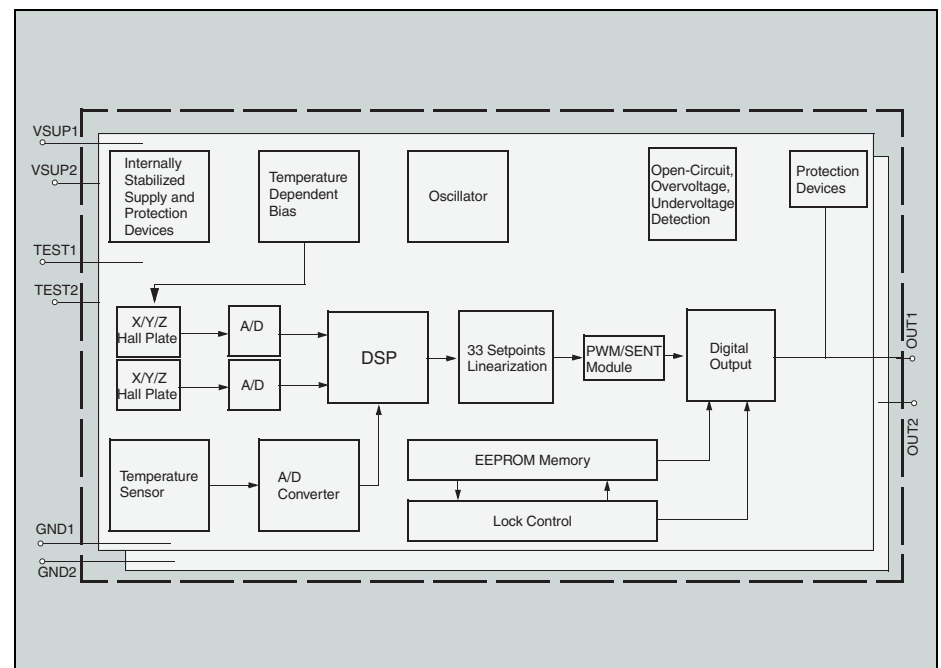


Fig. 1: Block diagram of the HAR 379x

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