

HAR 37xy

Sept/2015



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

HAR 37xy is the dual-die version of the HAL 37xy family using Micronas proprietary 3D HAL technology. It is available in the same SOIC8 package as of HAL 37xy. Each sensor provides true redundancy as it consists of two independent dies stacked 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 has several members. HAR 372x provide linear, ratiometric analog output signals with integrated wire-break detection working with pull-up or pull-down resistors. Compared to the HAR 372x the HAR 3715 is splitting the 360° measurement range either into four repetitive 90° (MOD 90°) or three 120° (MOD 120°) segments. HAR 373x features digital output formats like PWM and SENT (according to SAE-J2716 release 2010). 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.

Conventional planar Hall technology is only sensitive to the magnetic field orthogonal to the chip surface. In addition HAR 37xy is

also sensitive to magnetic fields applied in parallel to the chip surface. The magnetic sensitive cell can measure three magnetic field components BX, BY and BZ. On-Chip signal processing calculates the angle out of two of these magnetic field components and converts this value to an output signal. Due to the measurement method, the sensor exhibits excellent drift performance over the specified temperature range resulting in a new class of accuracy for angular and linear measurements.

The sensor contains advanced on-board diagnostic features that enhance fail-safe detection. In addition to standard checks, such as over-/undervoltage detection and wire break, internal blocks such as ROM and signal path are monitored during normal operation.

The devices are designed for automotive and industrial applications and operate with junction temperature range -40 °C up to 170 °C.

The HAR 37xy family is available in a very small eight-pin SOIC8 package. The package outlines and the X-Y position of the sensitive areas are identical to the single-die version HAL 37xy.

Features for each Die

- ◆ Angular and position measurement extremely robust against temperature and stress influence
- ◆ 12 bit ratiometric linear analog output for HAR 372x
- ◆ Modulo 90°/120° for HAR 3715
- ◆ 0.2 kHz to 2 kHz PWM (up to 12 bit) or 12 bit SENT output for HAR 373x
- ◆ Programmable arbitrary output characteristic with up to 33 setpoints
- ◆ 8 kHz sampling frequency
- ◆ Operates from 4.5 V up to 5.5 V V_{SUP}
- ◆ Operates from -40 °C up to 170 °C T_J
- ◆ Programming via the sensor's output pin
- ◆ Programmable characteristics stored in a non-volatile memory with redundancy and lock function
- ◆ Programmable signal path parameters, like, zero angle position, gain and offset, clamping levels, filter settings, etc.
- ◆ On-board diagnostics of different functional blocks of the sensor

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Major Applications

Due to true redundancy, HAR 37xy can address safety-critical applications according to ISO26262 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, throttle valves and chassis position sensors (ride-height control)

Development Tools

Each die can be programmed during the final manufacturing process by adjusting the output signals directly to the input signal (like mechanical angle, distance, or current). 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 application kit for engineering:

- ◆ Micronas programmer board (HAL-APB V1.5)
- ◆ 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, and a ratiometric linear analog, PWM, or SENT output.

Available Types and Behavior

Type	Output Format	Detectable Field Component
HAR 3715	Analog/Modulo	B_X and B_Y
HAR 3725	Analog	B_X and B_Y
HAR 3726	Analog	B_Y and B_Z
HAR 3727	Analog	B_X and B_Z
HAR 3735	PWM & SENT	B_X and B_Y
HAR 3736	PWM & SENT	B_Y and B_Z
HAR 3737	PWM & SENT	B_X and B_Z

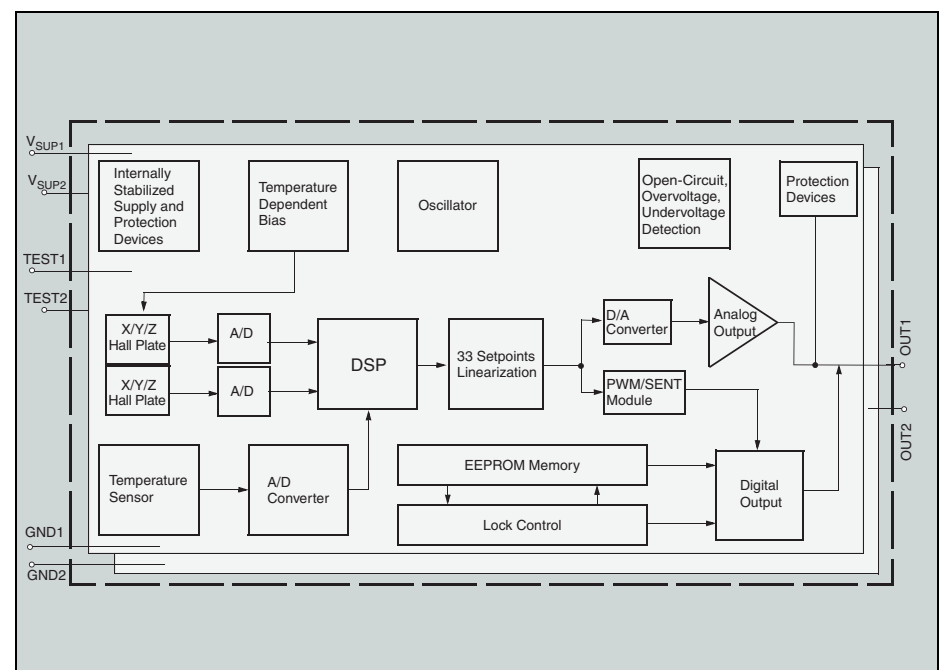


Fig. 1: Block diagram of the HAR 37xy

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Edition Sept. 22, 2015; Order No. PI000155_001E