HAC 37xy

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HAC 37xy
Programmable 2D Position Sensor Family
with Integrated Capacitors

HAC 37xy is a new subfamily of 2D position sensors offering optimal protection against electromagnetic interference. This EMC-optimized Hall sensor subfamily comprises the second generation of 2D position sensors using Micronas' proprietary 3D HAL technology. Decoupling capacitors are already integrated into the TO92UF package.

With its integrated capacitors, HAC 37xy meets stringent ESD (system level) and EMC (BCI, 85V DCC, etc.) requirements and eliminates the need for a PCB, thus reducing the total system size and cost.

HAC 372x provides a linear, ratiometric analog output signal with integrated wire-break detection working with pull-up or pull-down resistor. Compared to HAC 372x, the HAC 3715 is splitting the 360° measurement range either into four repetitive 90° (MOD 90°) or three 120° (MOD 120°) segments.

HAC 373x features digital output formats like PWM and SENT according SAEJ2716 standard. The digital output format is customer configurable. In SENT mode, the sensor transmits SENT messages with and without pause pulse according to SAEJ2716 Rev. 3.

The PWM output is 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, HAC 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. 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 sensors contain 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 sensors are available in a small five-pin leaded, single-mold TO92UF package.

Features

◆ Angular and position measurement extremely robust against temperature and stress influence

◆ Integrated capacitors for robust Electromagnetic Compatibility (EMC) and PCB-less applications

◆ 12 bit ratiometric linear analog output for HAC 372x

◆ Modulo 90°/120° for HAC 3715

◆ 0.2 kHz to 2 kHz PWM (up to 12 bit) or 12 bit SENT output for HAC 373x

◆ Programmable arbitrary output characteristic with up to 33 setpoints

◆ Operates from 4.5 V up to 5.5 V V_{SUP}

◆ Operates from $T_J = -40$ °C up to 170 °C

◆ Programming via the sensor's output pin

◆ Programmable signal path parameters, like zero angle position, gain and offset, clamping levels, filter settings, etc.

◆ Programmable 32 bit identification number for customers

◆ On-board diagnostics of different functional blocks of the sensor

◆ Certified SPFM > 90%

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Major Applications

Due to the sensors' versatile programming characteristics and their high accuracy, HAC 37xy is the optimal system solution for applications such as:

◆ Linear movement measurements in transmission systems, EGR valves, as well as cylinder and valve position measurements

◆ Rotary position measurement in gear selectors, turbo-chargers, throttle valves and chassis position sensors (ride-height control)

Development Tools

The sensors 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 sensor, magnet, and mechanical positioning can be compensated in the final assembly.

Micronas offers easy-to-use application kits for engineering:

◆ Micronas programmer board and USB-Kit

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

Product Variant	Output Format	Detectable Field Component
HAC 3715	Analog/Modulo	B_X and B_Y
HAC 3725	Analog	B_X and B_Y
HAC 3726	Analog	B_Y and B_Z
HAC 3727	Analog	B_X and B_Z
HAC 3735	PWM and SAEJ2716 SENT	B_X and B_Y
HAC 3736	PWM and SAEJ2716 SENT	B_Y and B_Z
HAC 3737	PWM and SAEJ2716 SENT	B_X and B_Z
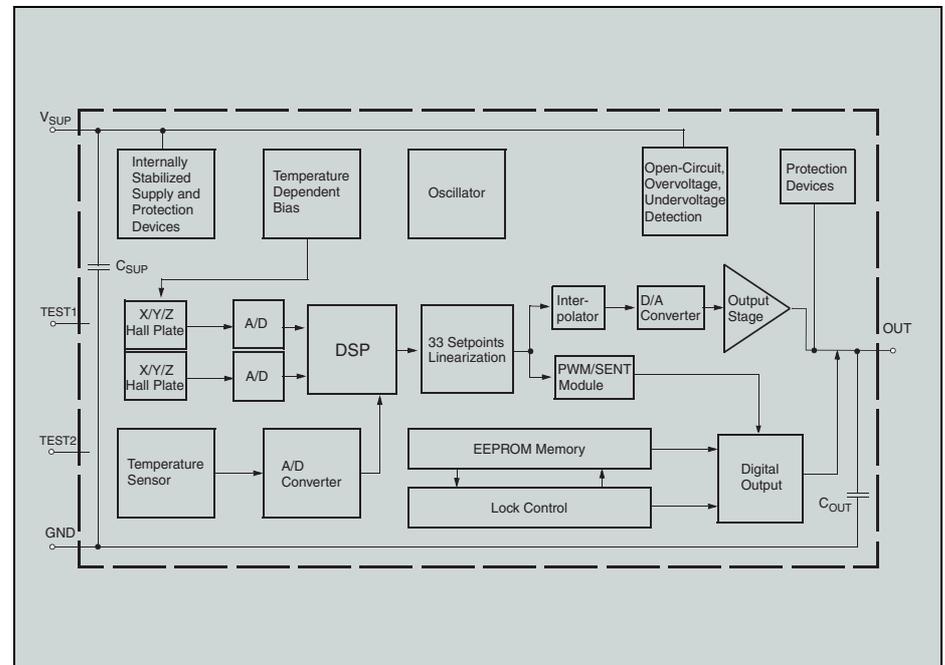
Fig. 1: Block diagram of HAC 37xy