

Attracting Tomorrow



Technologies & Products Press Conference 2018

3D Hall-effect position sensor with stray field compensation

Next generation of highly flexible position sensors with extraordinary magnetic performance

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Position measurement more important than ever – especially in automotive and industrial

Modern vehicles require optimized sensor and actuator solutions

- Increased safety in braking, suspension and steering modules
- Enhanced comfort and reliability by replacing mechanical and hydraulic systems with electric systems and contactless sensors
- Increased energy efficiency and reduced CO₂ emissions
- Improved cost efficiency



Robots and automated machines require position, linear and rotational movement measurement

- Increased energy efficiency
- Improved system performance and reliability
- Improved safety of equipment
- Reduced system cost



**Hall-effect sensors are an ideal solution for position measurement
in a wide range of automotive and industrial applications**

Main requirements for magnetic field sensors

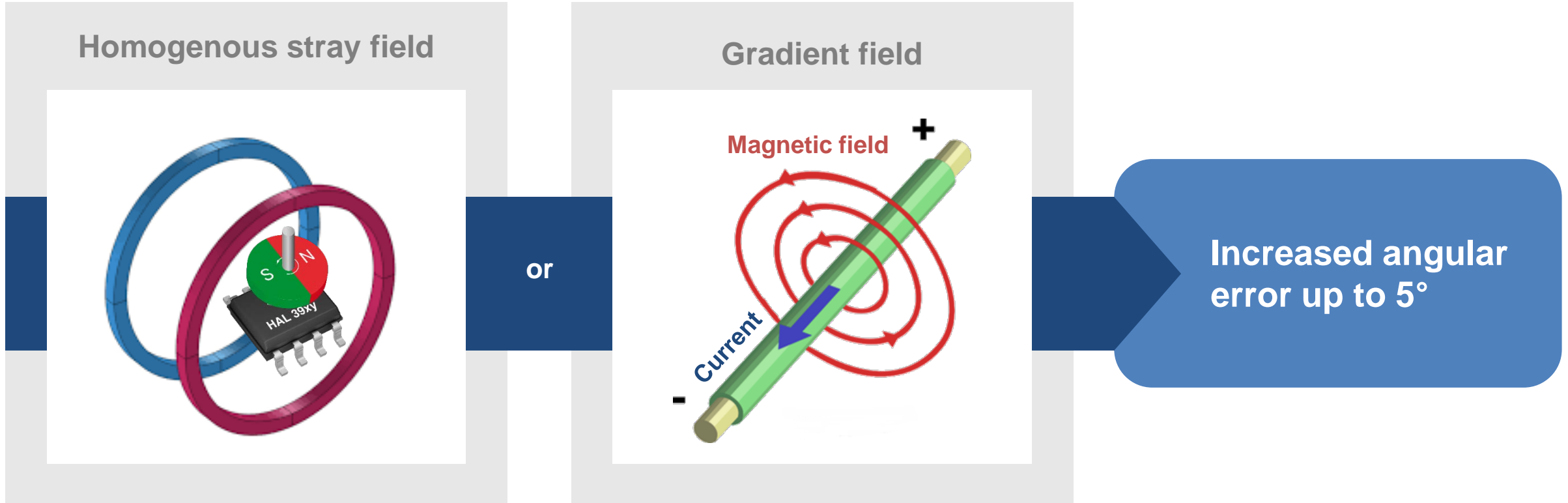
Stray field robustness	
Functional safety	• Innovative sensor array
Redundancy	• Flexible architecture
Mechanical robustness	• Efficient on-chip diagnostics
3D capability	• Advanced packaging
Digital interfaces	• Direct battery supply
Low power mode	



Cost-efficient and robust solution with high flexibility for today's automotive and industrial market needs

The challenge of stray field immunity

Two kinds of stray fields can be present



Active compensation is required in the presence of stray fields

Introducing the new 3D HAL[®] position sensors with stray field compensation

Key data

Types	HAL [®] 3900, 3930, 3980
Package	SOIC8
Dimensions	6.0 mm x 4.9 mm x 1.6 mm
Interface	SPI, SENT, PWM, PSI5
Magnetic field range	±10 to ±100 mT
Angular error w/o aging	±0.6°
Additional error after aging	±0.6°
Error due to stray field	<0.1°
Noise error	±0.17%
Non-linearity error	±0.20%

Features & benefits

- Four measurement modes:
 - Linear position
 - Rotary position up to 360°
 - Rotary position up to 180°
 - 3D magnetic field
- Enables fast development of device variants
 - Programmable firmware for fast prototyping
 - Easy adaptation to interface standards such as SENT and PSI5
- Programmable via output pin
- ISO 26262 and ASIL-B ready

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Technology



Four measurement modes in a single sensor with immunity to stray fields

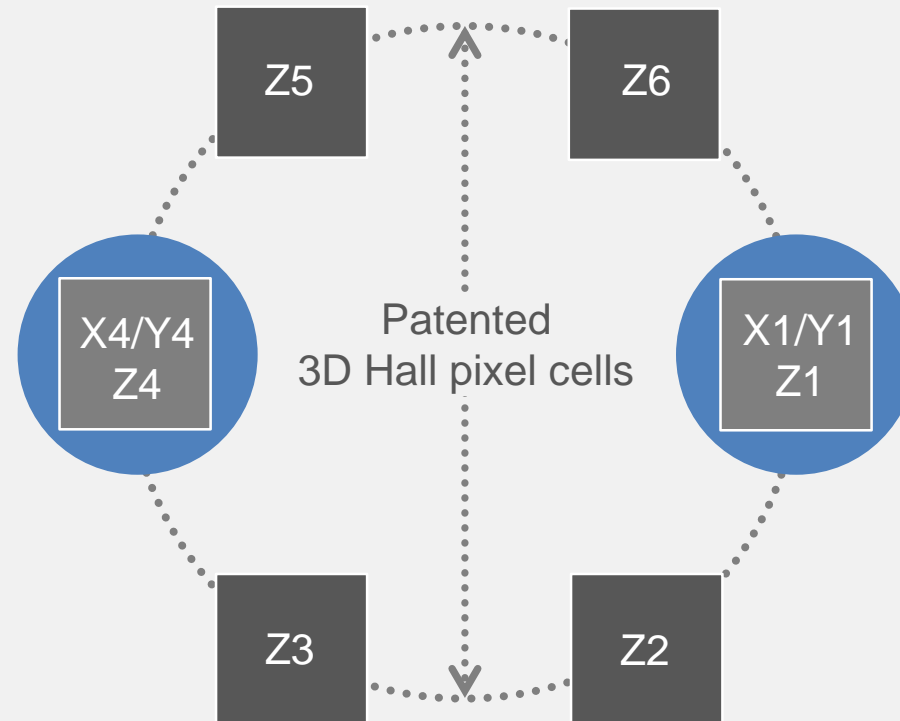
Unique sensor array concept with stray field compensation

Linear position

- Extended range up to 30 mm
- E.g. brake pedal



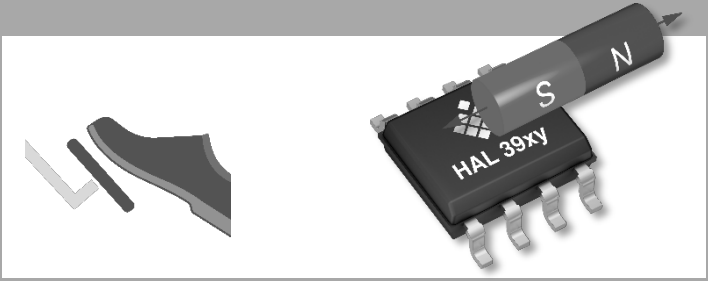
Hall-effect sensor array



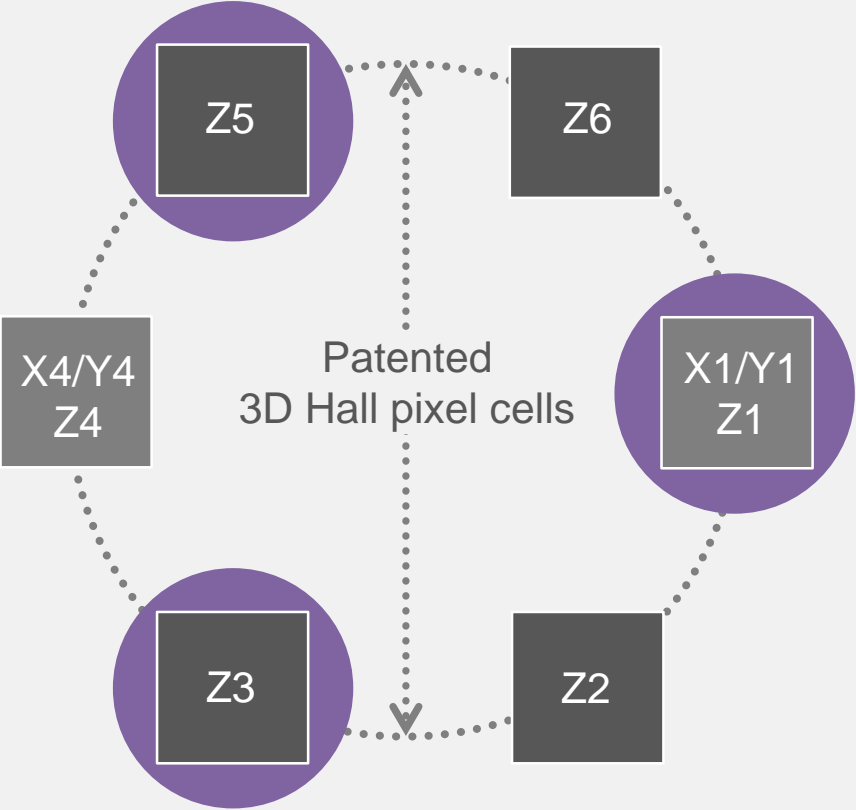
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Hall-effect sensor array



Rotary position up to 360°

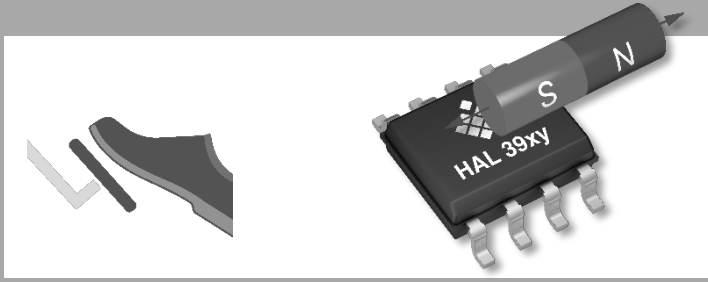
- E.g. control knobs
- E.g. chassis position



Unique sensor array concept with stray field compensation

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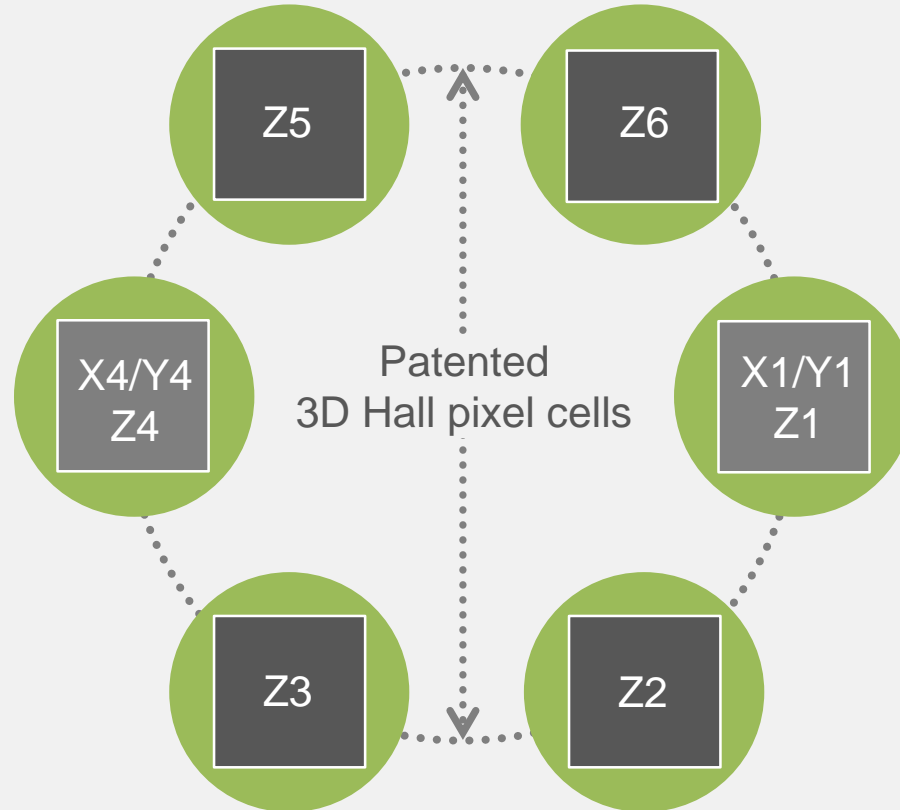


Rotary position up to 180°

- Compensation of gradient fields generated by power lines
- E.g. accelerator pedal

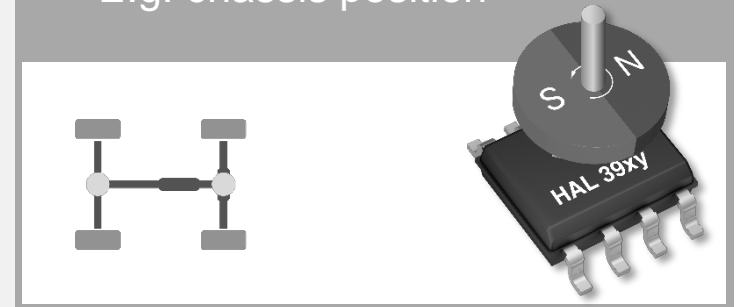


Hall-effect sensor array



Rotary position up to 360°

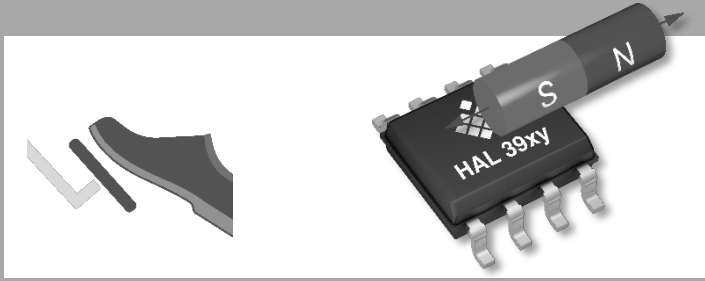
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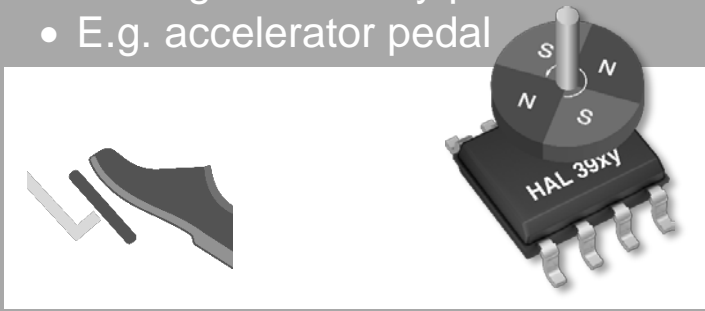
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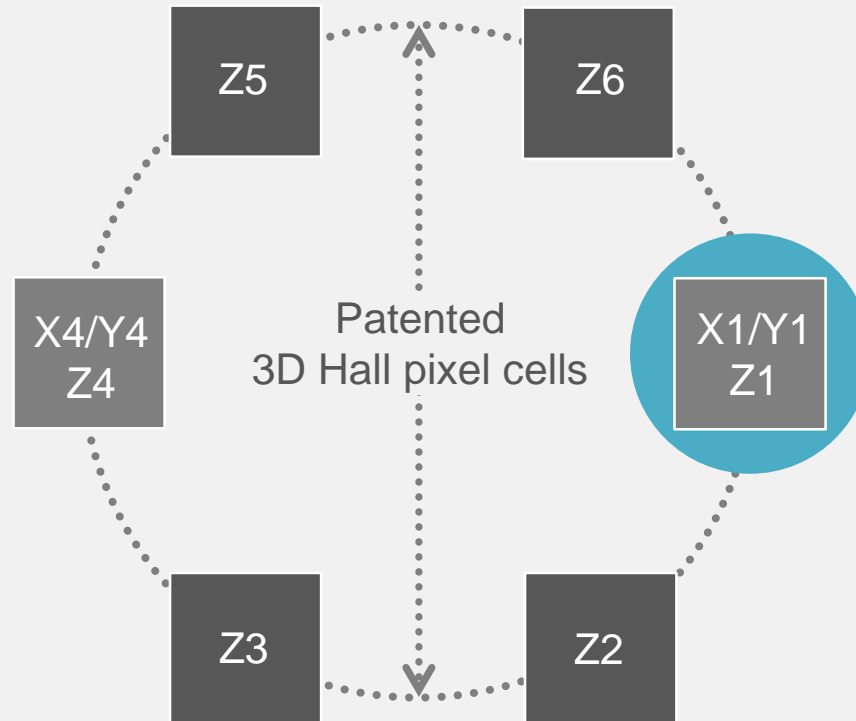


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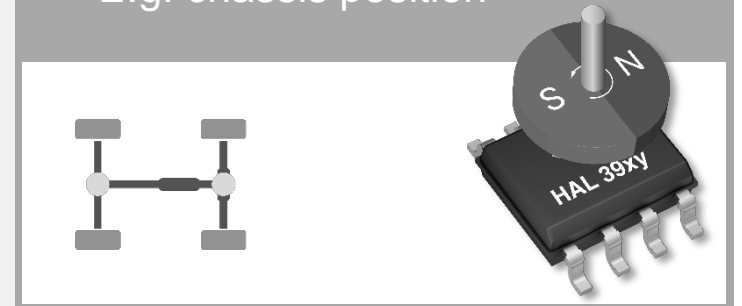


Hall-effect sensor array



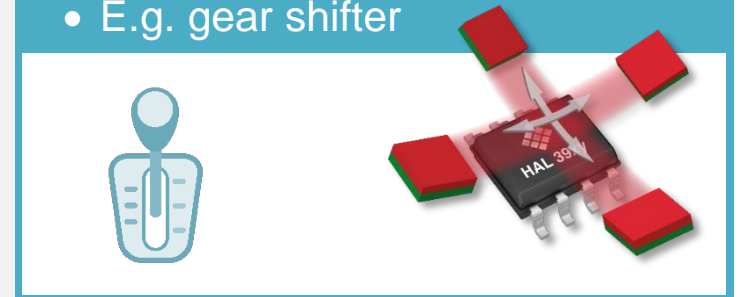
Rotary position up to 360°

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Real 3D magnetic field measurement (B_x , B_y , B_z)

- No stray field compensation
- E.g. gear shifter



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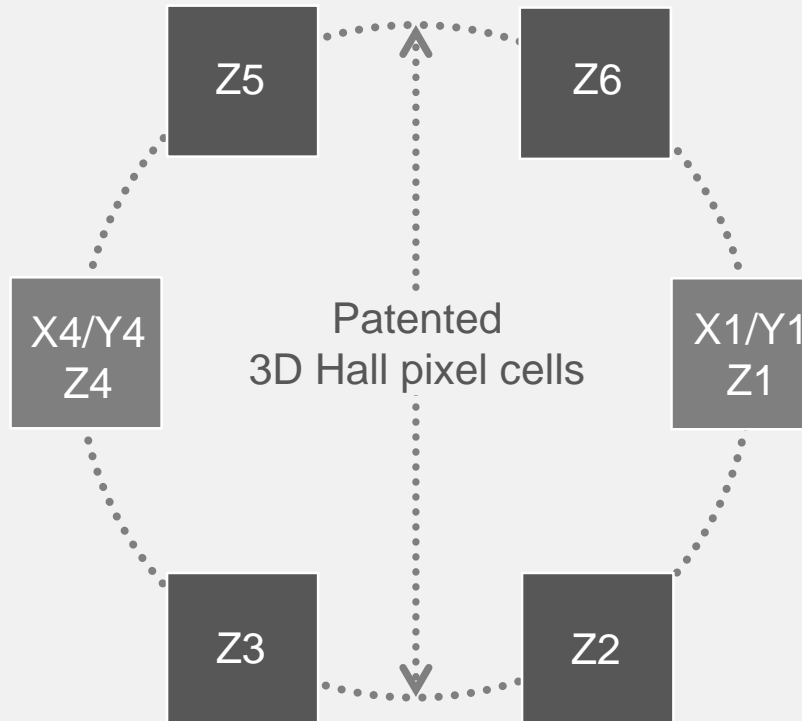


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Hall-effect sensor array



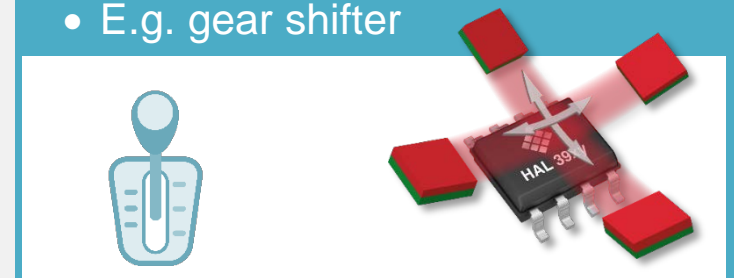
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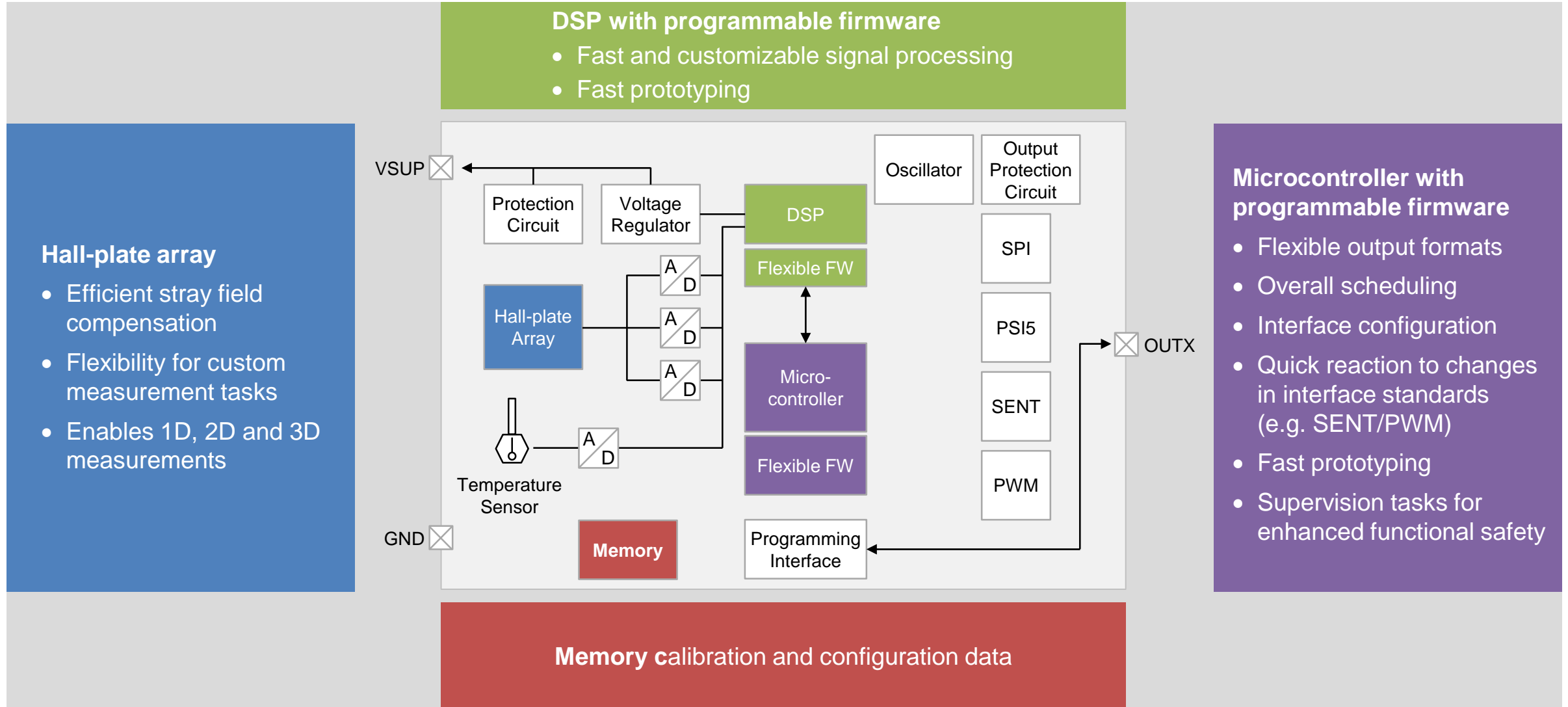
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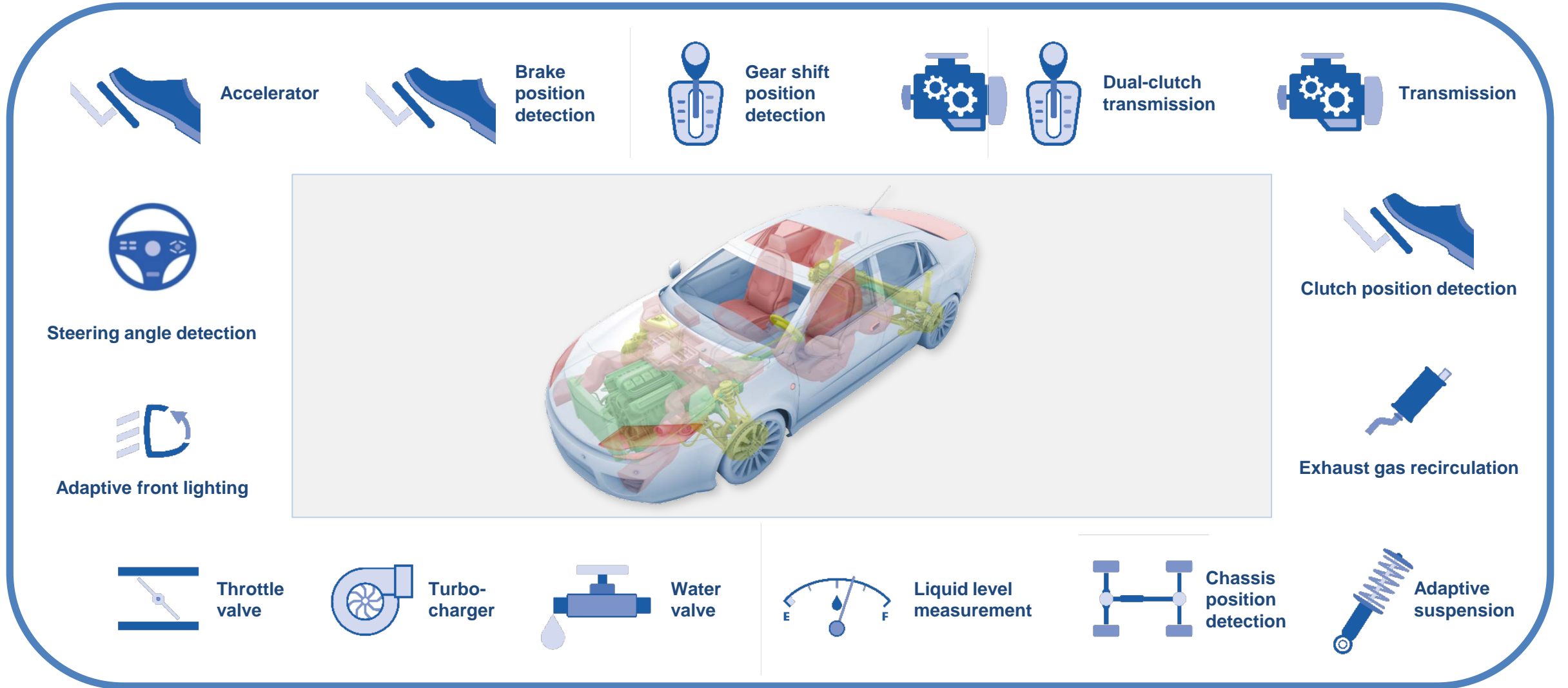


Customer configurable for different measurement tasks

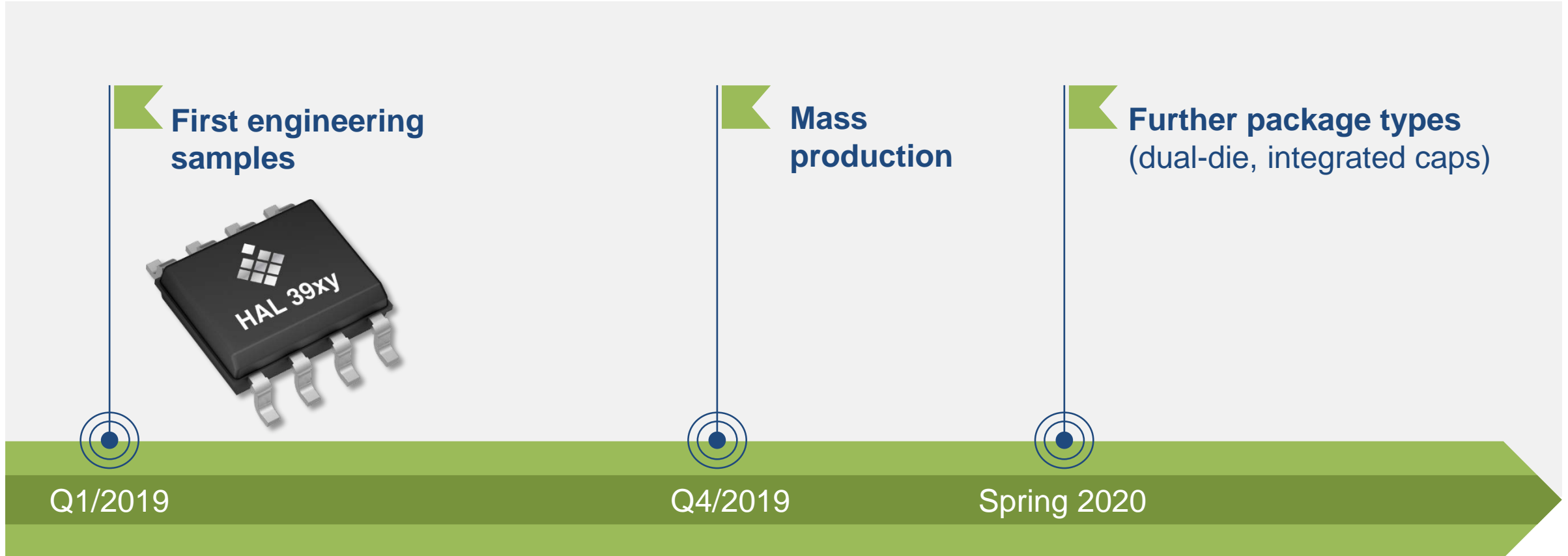
Flexible architecture of HAL 39xy 3D position sensors



Wide range of automotive applications



Outlook for HAL[®] 39xy 3D Hall-effect sensors





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