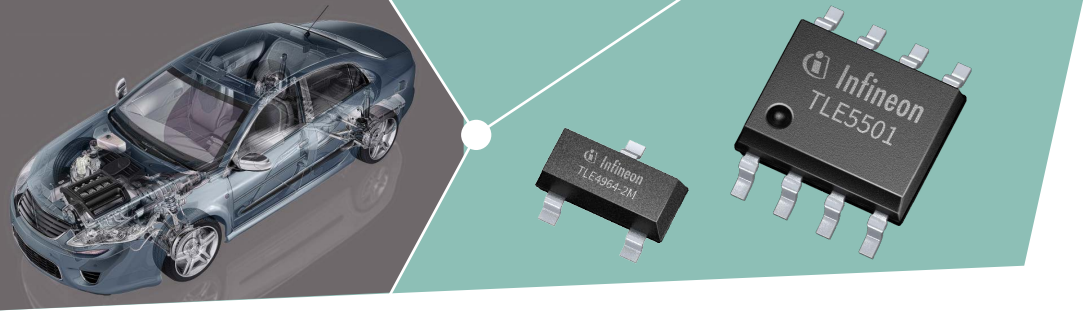


Application brief

Efficient actuation and motor commutation

Efficient, smooth, low noise actuation and optimal actuators with XENSIV™ magnetic position sensors

Improved fuel economy and the reduction of CO_2 emissions in passenger cars are the main development goals of car OEMs. Increasing adoption of different drivetrain architectures, such as DCT (Dual Clutch Transmissions), DHT (Dedicated Hybrid Transmission), etc. calls for efficient actuator solutions driven by electric motors to automate the clutch and gearshift & they're by provide excellent fuel economy and new drivability features.

Transmission actuators directly influence controllability & dynamics, the size, costs and efficiency of transmissions. Aiming to meet the present and future market needs, these actuation systems calls for stringent requirements in terms of operating temperature, accuracy etc. and at the same time trying to bring down the system cost.

Increased adoption of BLDC motors in actuators provides high dynamics and torque density in minimal space, with low noise & increased lift time. BLDC motor with a position sensor will further provide superior controllability. Integration of motor control, power functional block within the actuator are enabling Tier 1 to develop smart actuators.

Commercial vehicles currently mostly equipped with manual transmissions, but increased hybridization means will drive adoption of Automated Manual Transmission (AMT), DCT and automatic transmission in a phased manner and drive demand for transmission actuators.

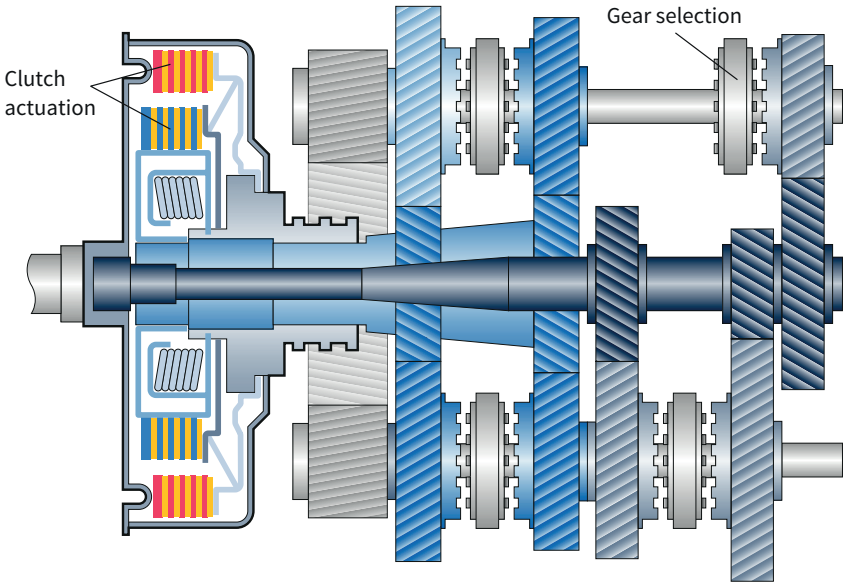
Actuators – Key requirements

- High dynamics and torque density
- Increased integration
- Low power consumption
- Harsh ambient conditions
- Modular
- Compact size
- Low noise
- Safety & diagnostic support
- Reduced weight

Key applications

- Clutch actuator
- Gear actuator
- Transfer case actuator
- Hydraulic actuator

Dual Clutch Transmission (DCT) with clutch actuators



www.infineon.com/magnetic-position

The change in automotive industry with increasing & diverse drivetrain architectures calls for actuation solutions that are optimal, technology independent solution with different requirements & yet be modular to adapt for almost every transmission.

A rotor position sensor helps to provide the position information for motor commutation. Infineon has wide portfolio of position sensors for motor commutation to address wide range of requirements based on commutation type, accuracy, interface and system cost requirements.

Infineon sensors are exceptionally precise thanks to industry-leading magnetic technologies. We offer all magnetic sensor technologies with in-house production; thus, our customers can choose between Hall sensors, AMR (Anisotropic Magneto Resistive), GMR (Giant Magneto Resistive) or TMR (Tunnel Magneto Resistive) sensors in order to find their best-fit solution for their application.

Infineon angle sensors are available with analog Sin/Cos interface and digital interface (UVW, PWM, SPI IIF) optimized for motor commutation applications for customers requiring higher accuracy and end of shaft applications. Infineon switches are targeting cost optimized block commutation and out of shaft requirements.

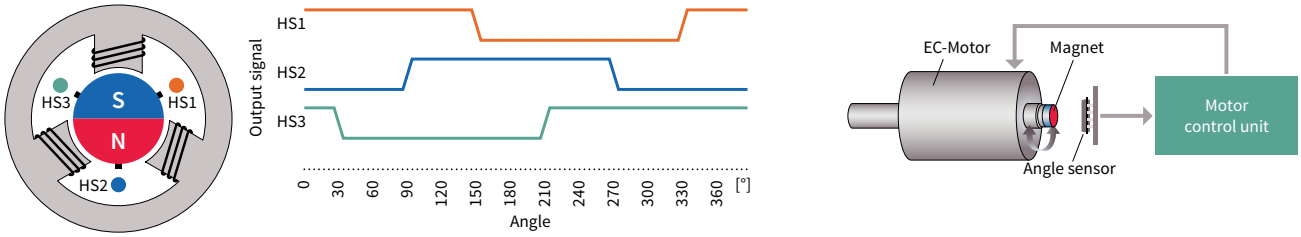
Typically, actuators with local control units use analog sensors to leverage on chip ADC resources. If time to market is crucial as well high EMI EMC topic customer could as well use standard digital interface to connect position sensor with the microcontroller.

Customer can realize flexible & cost optimized low integration design to highly integrated Actuator solutions using our Infineon position sensors along with our microcontrollers & embedded power products.

TLE5501 Tunneling Magneto Resistive (TMR) analog sensor is offering high sensing sensitivity with a high output voltage, reducing the need for an internal amplifier. Thus, the sensor can be connected directly to the microcontroller without any further amplification. TLE/TLI496x-xM are integrated Hall-effect sensors that provide an easy-to-use and cost-effective solution for position sensing applications, requiring high temperature stability of the magnetic threshold.

Infineon is the perfect partner, and its wide-ranging magnetic sensor portfolio is the perfect choice to meet future market requirements. To learn more about transmission systems and how to solve today's challenges, have a look into Infineon's "Efficient transmission systems" whitepaper available for download at www.infineon.com/magnetic-position

Schematic of BLDC motor with a magnetic position sensors for commutation



Product name	Ordering code	Description
TLE5012B E1000	SP001166960	Digital GMR angle sensor with SPI + incremental encoder interface or Hall switch emulation output
TLE5014SP16 E0001	SP004232096	ISO 26262-compliant (ASIL C-metric), programmable GMR angle sensor with PWM, SENT or SPC, SPI output
TLE5501 E0001	SP001621824	Tunneling Magneto Resistive (TMR) angle sensor with analog sin/cos output
TLE5009A16 E2210	SP001296114	Fast Giant-Magneto Resistive (GMR) angle sensor family with analog sin/cos output with built in amplifier
TLE5109A16 E2210	SP000956966	Fast Anisotropic Magneto Resistive (AMR) angle sensor family with analog sin/cos output with built in amplifier
TLE4964-2M	SP000923330	Integrated highly accurate Hall effect switch with superior supply voltage capability, additional product derivatives available

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