

New Product Update

The industry's fastest and most accurate anisotropic magneto resistive (AMR) angle sensor

Innocent Irakoze

Position Sensing - Automotive

Agenda

- Design challenges
- TMAG61x-Q1 overview
- Application examples
- Getting started

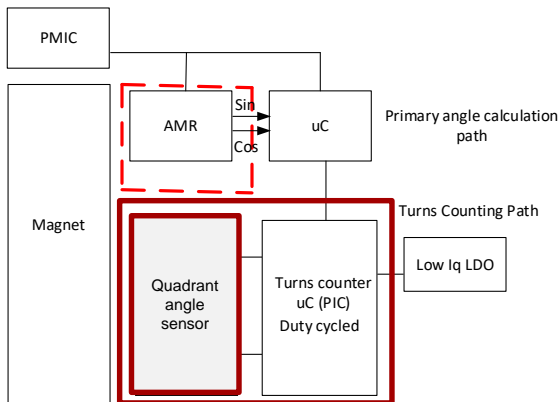
Design challenges

Problem:

- Product for measuring angle with smallest angle error (<1 degrees) in high speed applications
- Keep track of EPS motor turns count at key off (<100uA)

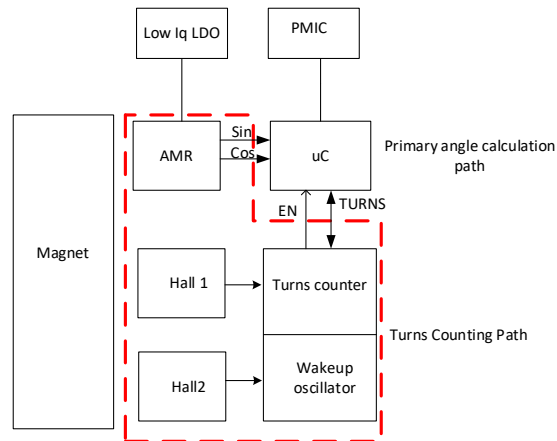
Solutions today:

- Use a separate ASIC (or a PIC) + Low Iq LDO for turns count (or)
- Use a custom PMIC with integrated low power cycling feature



EPS customers' present solution

Integrated turns counter
Eliminates need for ASIC or PMIC
Saves space & BOM!



TI's solution, TMAG6181-Q1

TMAG618x-Q1 overview

AMR angle sensor with differential sine and cosine and integrated turns counter / 360 degrees

Features

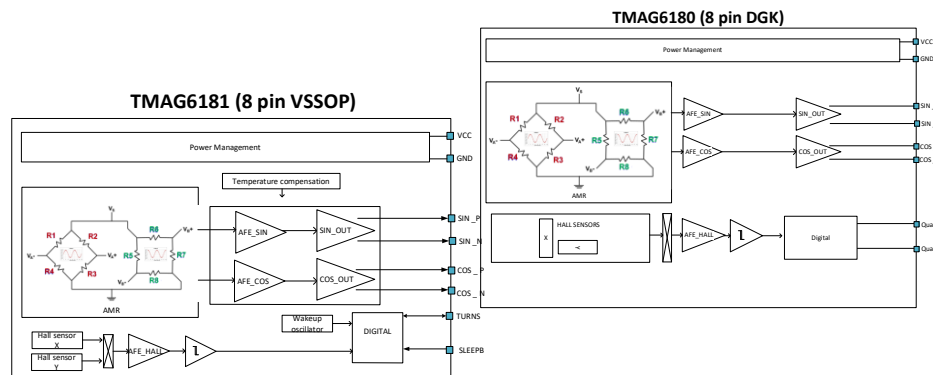
- <0.6 degree angle error drift across temperature
 - 0.1 degree typical error
 - 0.4 degree (max at 3.3V)
 - 0.56 degree (max at 5.5V)
 - Supports angular speed up to 100kRPM
 - Supports both differential and single-ended sin/cos outputs
- Integrated output amplifier to drive long cables
- Accurate motor position sensing for even pole pair motors
- Wide operating magnetic field range: 20mT to 1T
- Fast response time (2 μ s)
- Low power duty cycle mode (< 50uA)
- Integrated 12 bit turns counter keeps track of rotations in low power mode (up to 8kRPM) and active mode (32 kRPM)
 - PWM output on turns pin (**TMAG6181-Q1**)
- Integrated quadrant sensor to resolve full 360 degree measurements enabling usage independent of pole pairs
 - 2 digital outputs provide quadrant information (**TMAG6180-Q1**)
- V_{CC} from 2.7V to 5.5V
- 8 pin VSSOP (3mmx3mm body)

Applications

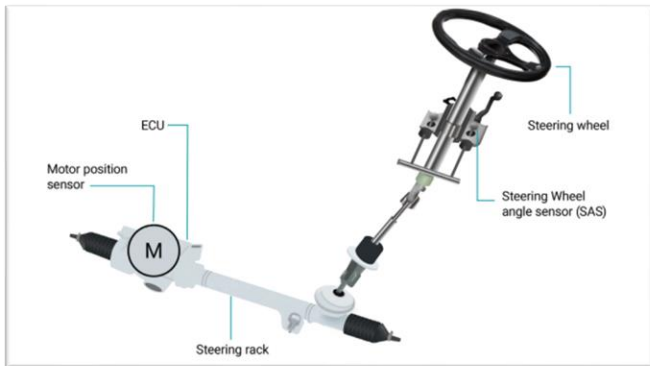
- EPS rotor position sensing, steering angle sensing
- Throttle control, pedal positioning
- Brushless DC motor control for even pole pair motors
- Actuator control and positioning
- Traction motors
- Integrated belt starter generators

Benefits

- Differential output helps to suppress common-mode output noise while traveling long distance traces
- Replaces the need for additional components in turns counter and other low power applications (**TMAG6181-Q1**)
- Reduces system power consumption with SLEEPB pin (**TMAG6181-Q1**)
- Q0 and Q1 pins are used for quadrature detection enabling AMR range from 180 degrees to 360 degrees (**TMAG6180-Q1**)
- Functional safety **ISO26262 ASIL B compliant (SIL2)**



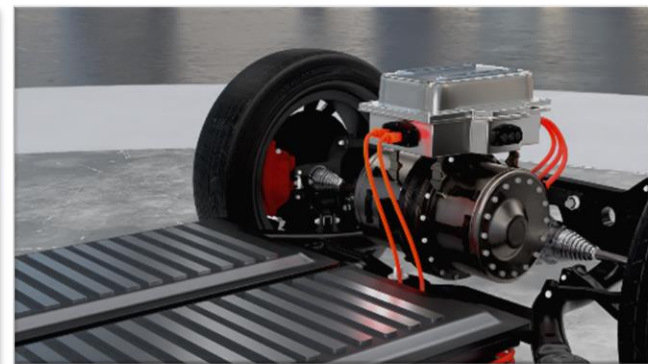
Application examples



Electric power steering (EPS)



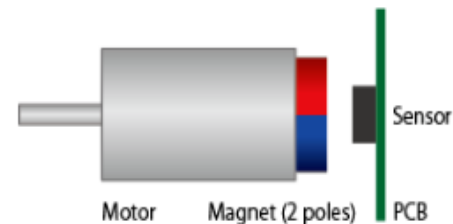
Electric bike motor
[Need a licensed picture](#)



Traction inverter

TMAG618x-Q1 is used for:

- Absolute steering wheel angle sensing (EPS)
- Motor shaft position for optimal system drive and control



Getting started

You can start evaluating this device leveraging the following:

Content type	Content title	Link to content or more details
Product folder	TMAG6181-Q1 datasheet	TMAG6181-Q1
Development kit	TMAG6180-6181EVM	TMAG6180-6181EVM
Development kit GUI	TMAG6180-6181EVM-GUI	Link
Simulation tool	TI magnetic sense simulator	TIMSS
Technical article	Designing a Position Sensing System with an AMR Angle Sensor	Link to Article
Technical white paper	Automotive Functional Safety and How TI is Helping Customers With High-Precision Position Sensors	Link to Article

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