IoT and Motion Control

integration by using
smart motor driver chips

TRINAMIC
MOTION CONTROL

TOP ELECTRONICS

About TRINAMIC Motion Control (Germany)

Founded in 2004, Trinamic is an established player in the global market of embedded motor and motion control.

Trinamic manufactures advanced ICs and microsystems
- Transforming digital information into physical motion.

Trinamic stands for precision, reliability and efficiency.

Key products

Dedicated motion control ICs
Smart motor drivers
Embedded microsystems

use cases

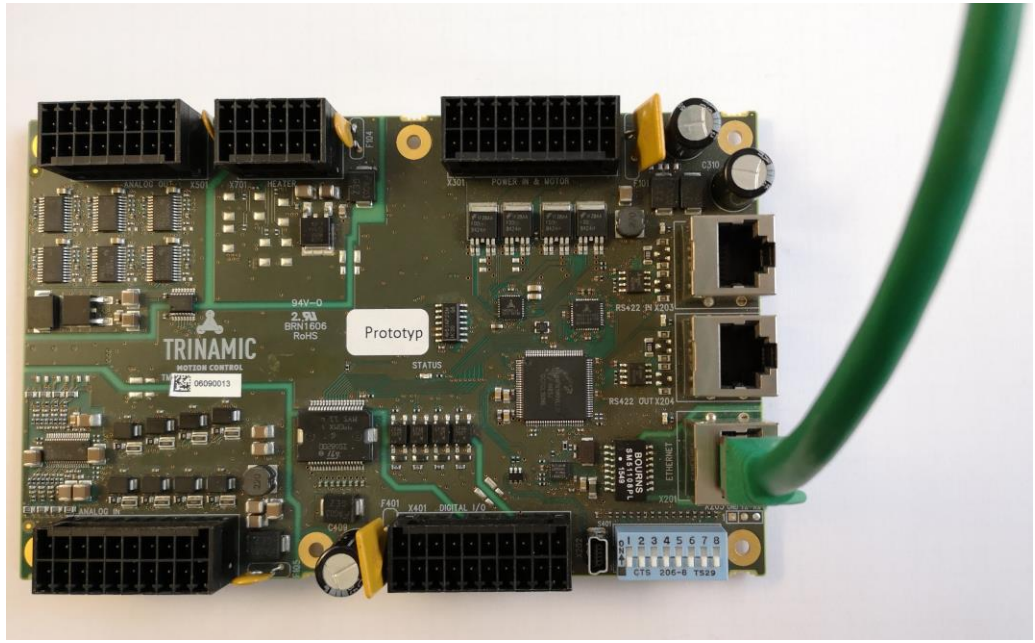
3D printing
Laboratory automation
Surveillance cameras
Textiles

About TOP-electronics

TOP-electronics is a technology-driven electronic components and modules distributor and representative, with offices in The Netherlands and in the USA.

TOP-electronics has a motivated, experienced team which works directly with our customers' engineers to provide a high level of local assistance, supporting our customers all the way from pre-development, through the design phase to production and after-sales.

IoT from a motion point of view



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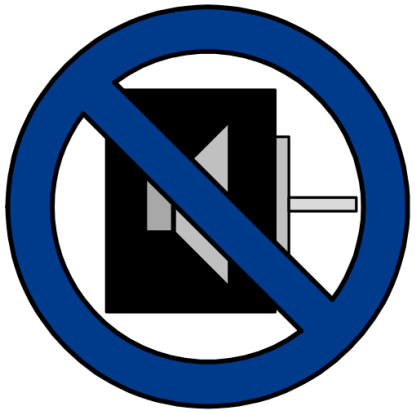
Challenges

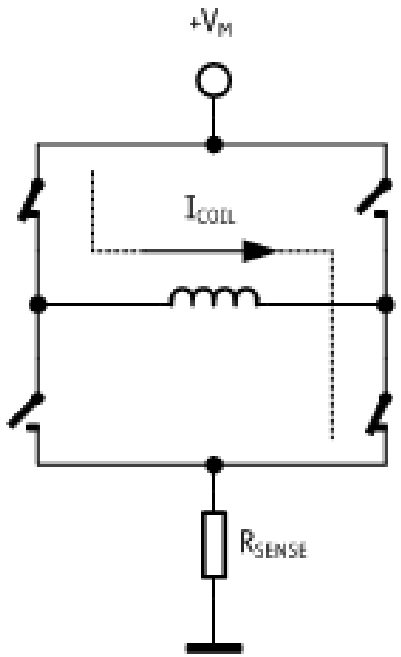
- Energy Efficiency
  - Low Voltage
  - Limited Energy
- Noise
  - Home devices
  - Wearables
- Cost and flexibility
  - Time-to-Market
  - Firmware
  - BOM



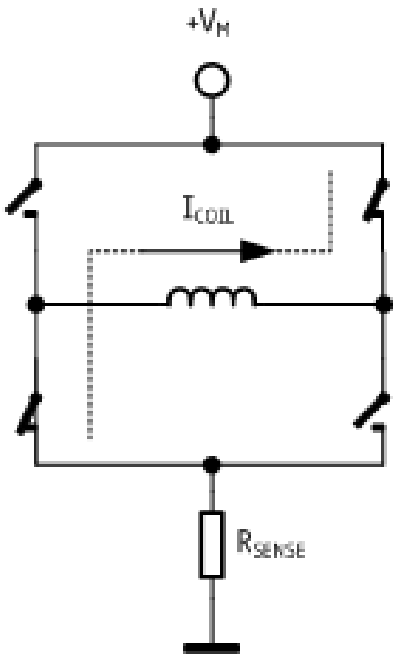
How to make IoT energy-efficient?

- Low Voltage
  - Current controlled vs Voltage PWM
- Limited energy
  - FOC

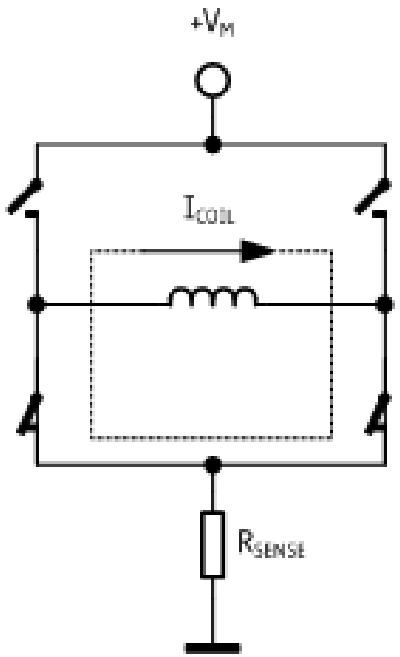
States of the switches



On

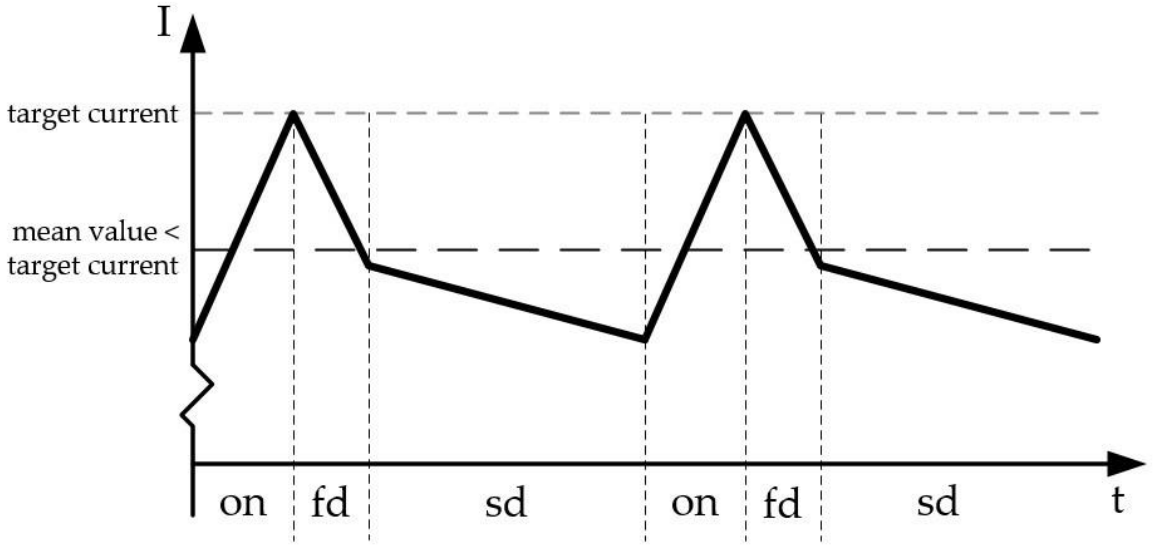


FD

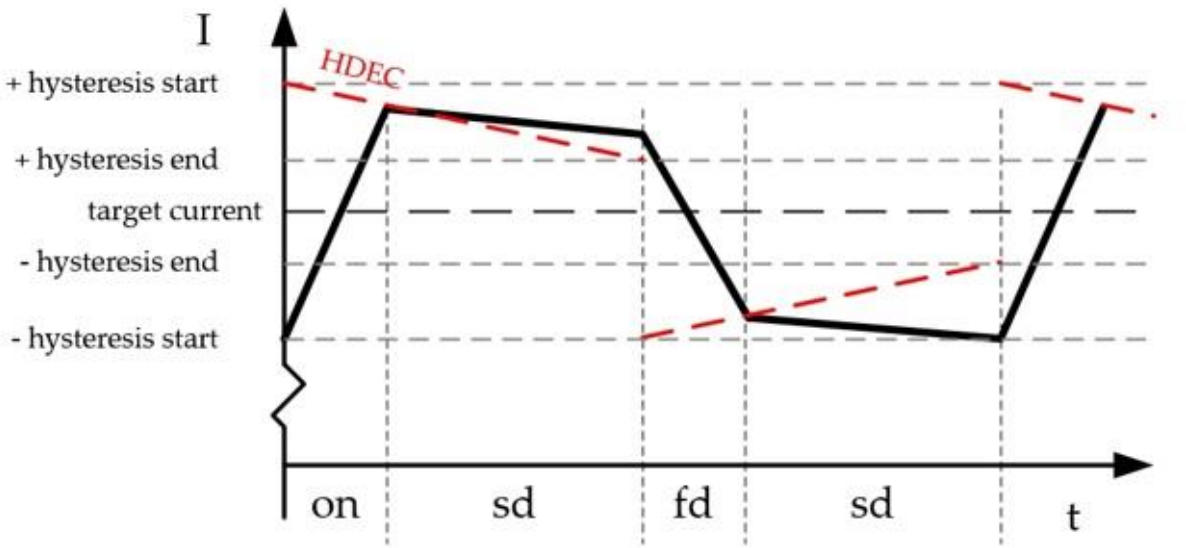


SD

Automatic Current Control

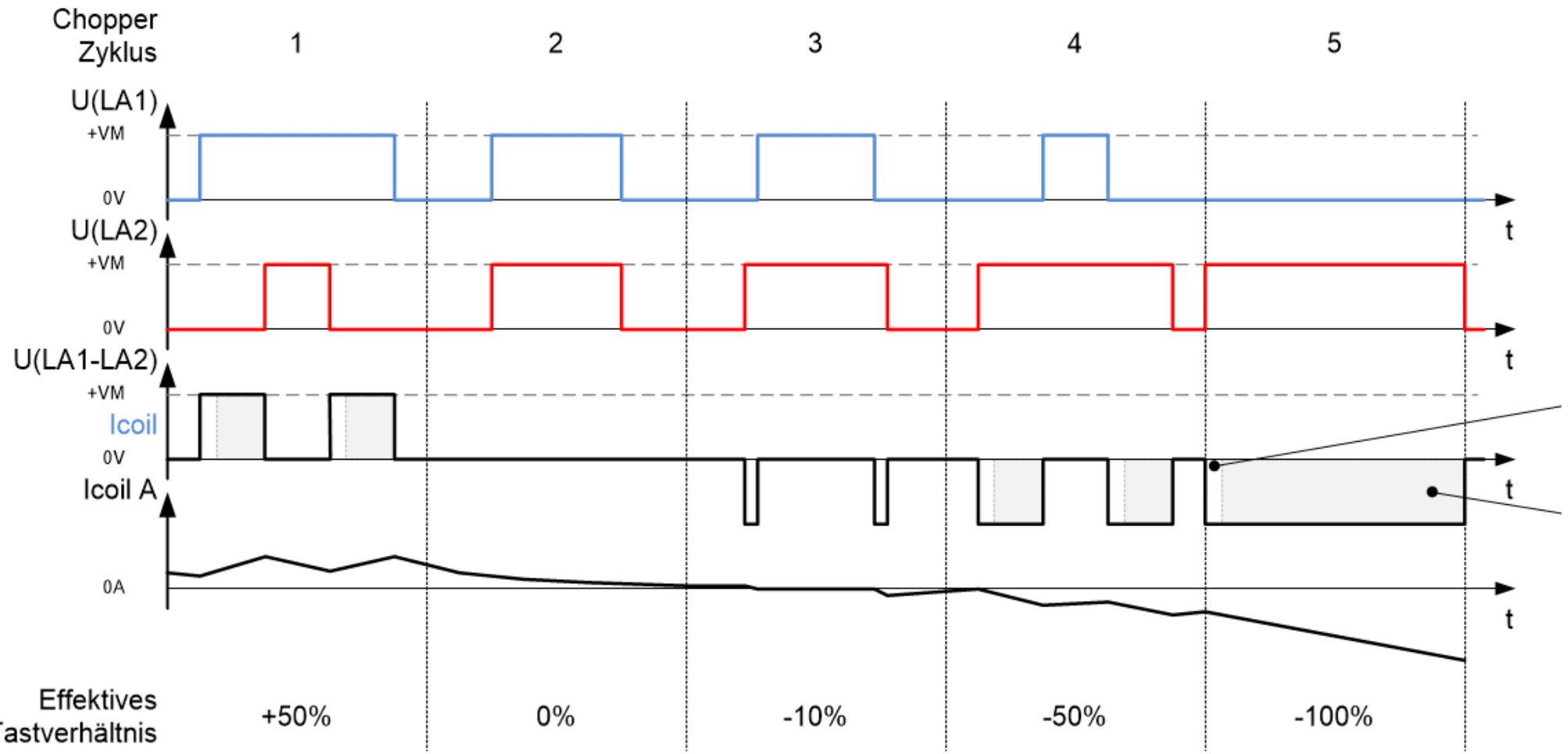


Classic constant off-time of PWM chopper mode



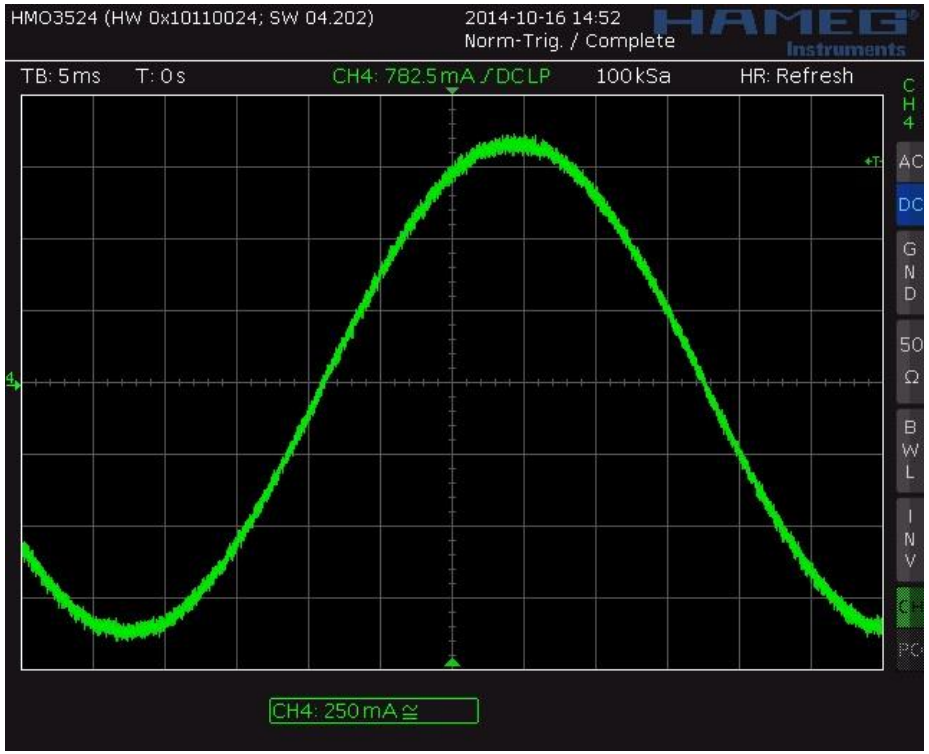
PWM chopper with applied hysteresis function

Voltage PWM / StealthChop

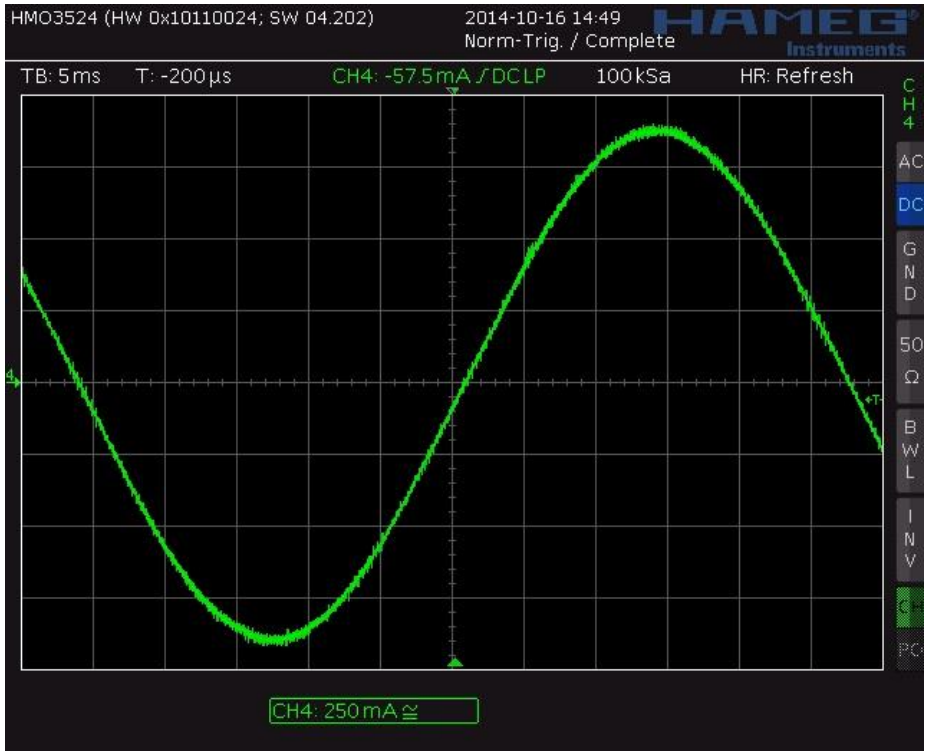


Noise

Voltage Control



Sine wave of one motor phase with current-based SpreadCycle™ chopper mode



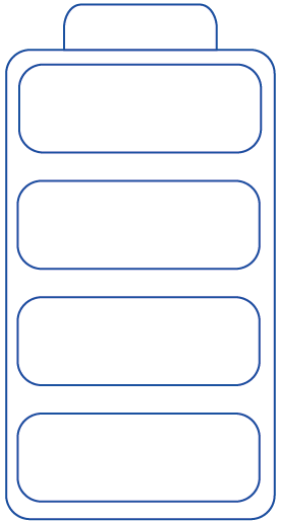
Sine wave of one motor phase with voltage-controlled StealthChop™ chopper mode

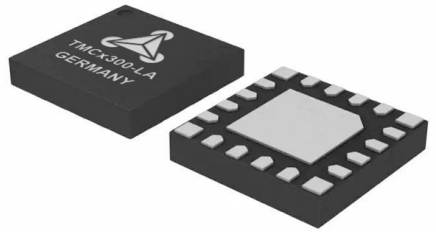
Benefits of Voltage PWM vs. Classic CC

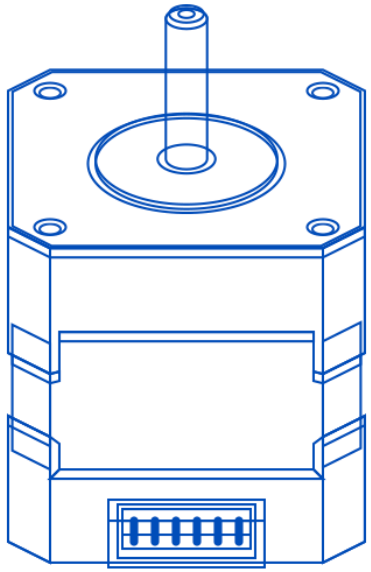
Voltage PWM / StealthChop	**Current control / SpreadCycle**
+ Silent at standstill and low speeds	- Chopper noise depending on motor, current, setup
+ Very smooth motion at low speeds	- Stricter control
+ Automatic “CoolStep“ at higher speeds	- CoolStep is limited to medium speeds
+ Lowest supply voltage at R_{coil} * I_{peak}	- Lowest supply voltage at ca. 2 * R_{coil} * I_{peak}

Challenging – Big Picture Small Chip

Breaks ground in portable motor control.







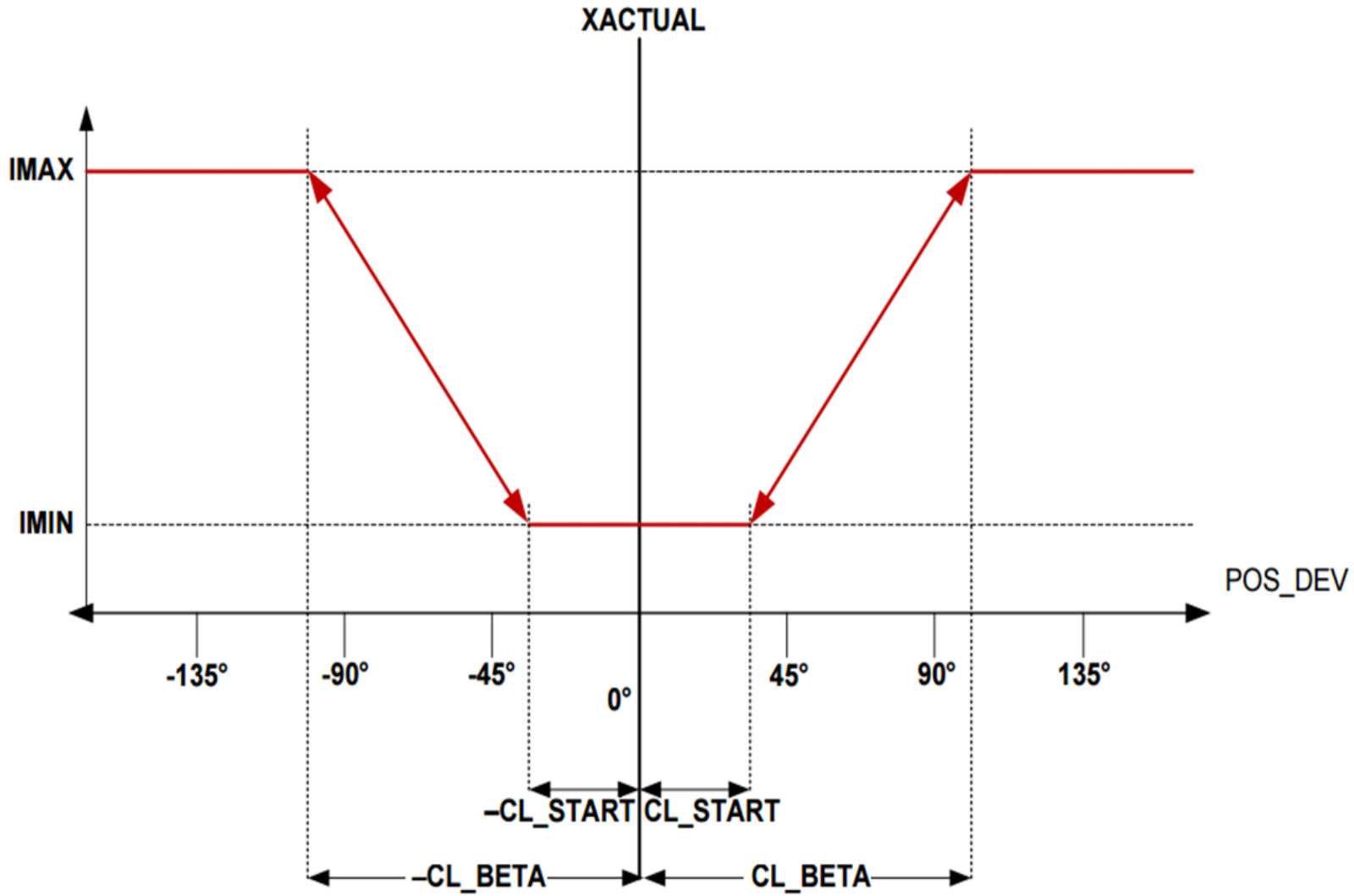
Supply Voltage
2...11V

Package
QFN20 3x3

Phase current
up to 1.4A RMS
up to 2A peak

Becoming energy efficient

Closed Loop (≠FOC)

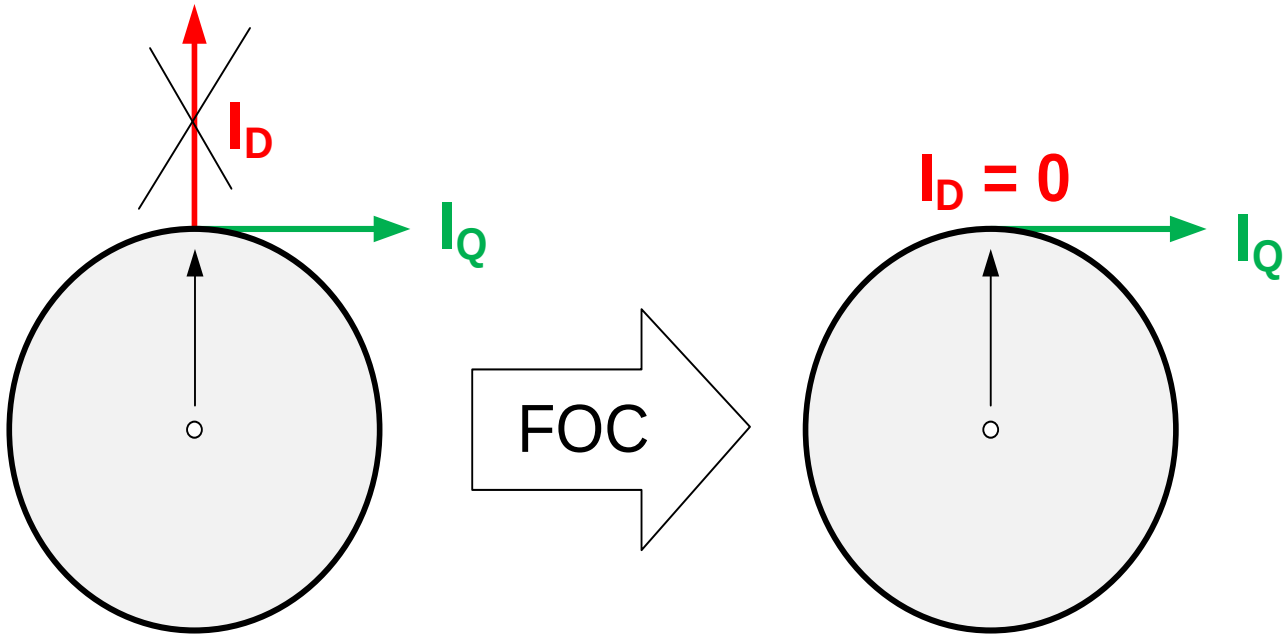


Why FOC?

turns electric motor

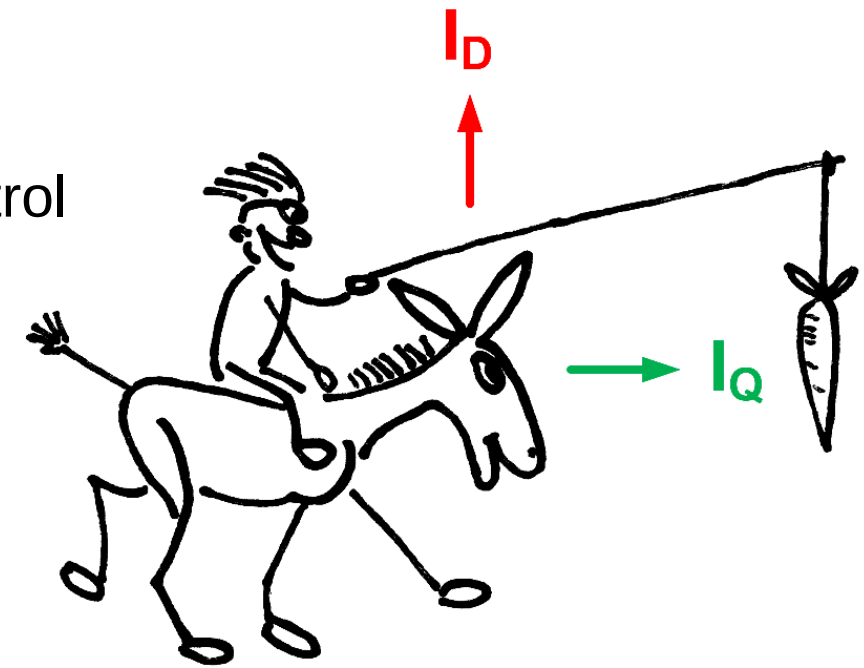
most energy efficient

BLDC motor ⇨ DC motor



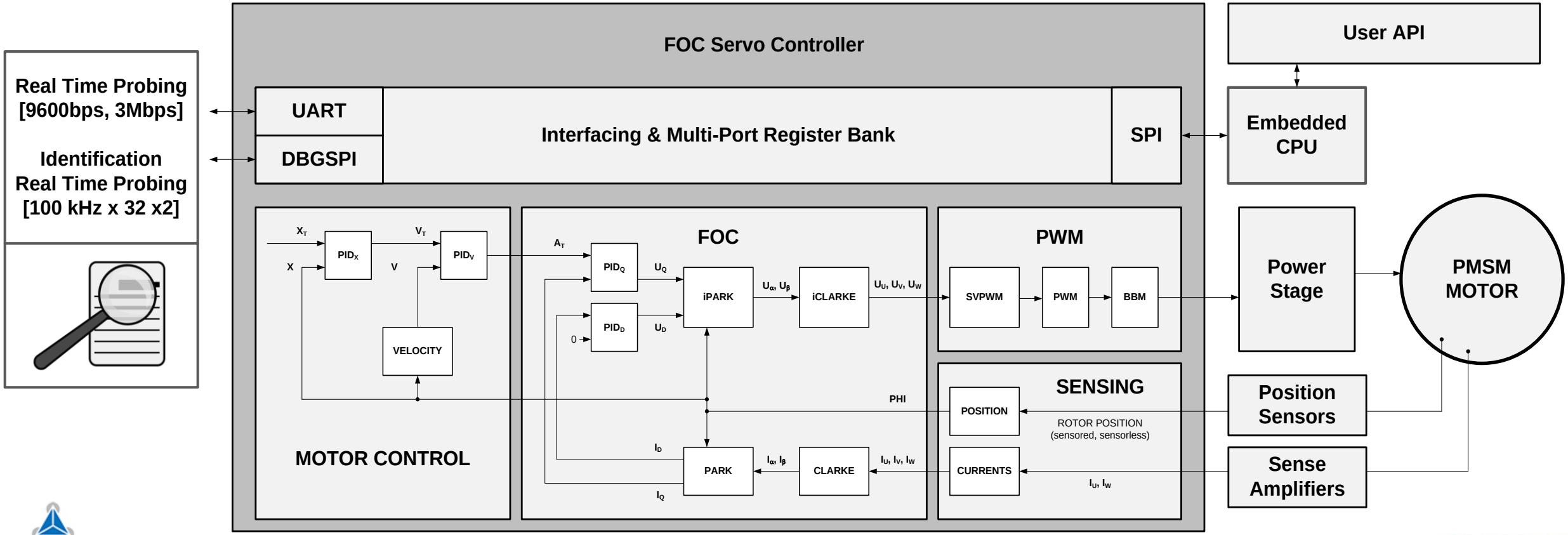
Why FOC?

- ✓ Most energy efficient method to turn an electric motor
- ✓ Intrinsic safety functionality by closed loop control
  (crucial to a lot of challenging applications)
- ✓ High precision by closed loop control
- ✓ High dynamic and high speed by closed loop control
- ✓ FOC is proven over 50 years



Firmware

- Hardware peripherals
- Data logging



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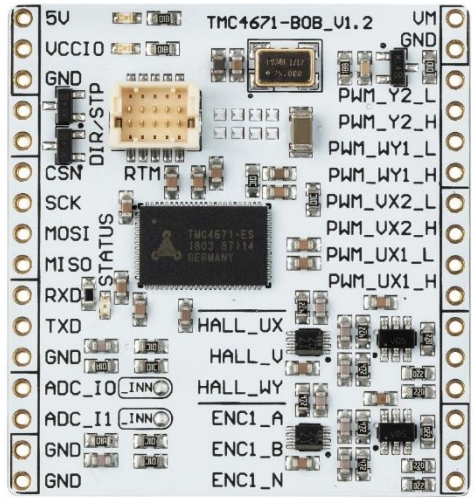
Flexibility

Free choice of processor

- Stick to your favorite
- Choose a cheaper one
- In these days: choose the available one ☺



Reduced Time-To-Market

- Plug and play building blocks
- Parameters instead of software
- Breakout Boards and Evaluation Systems

Energy Efficiency

Field Oriented Control

- Efficient current control reduces power consumption
- Compact, high-power motors for small drives
- Control loop enables traceability and evidence log

Visit TOP-electronics

with live demo's,
and
product information

We will be happy to exchange ideas with you!