

# MPS高性能无刷BLDC及伺服方案分享

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Confidential and Proprietary

**MPS**

# Corporate Profile

**MPS:** A worldwide silicon-based power solution company

**Founded:** 1997 in Silicon Valley, IPO in 2004 (NASDAQ: MPWR)

**Revenue:** \$844M in 2020

**Employees:** 2,200+ worldwide

**Products:** 4,000+ products in Cloud Computing, Automotive, Industrial, Consumer Electronics, and more

**Headquarters:** Kirkland, WA



San Jose, California, US Facility



# Corporate Profile

## Production Facilities

- Testing
  - **MPS Chengdu Facility**
  - Partner Testing Worldwide
- Assembly
  - Partner Assembly Worldwide
- IATF Certified Wafer Fabs

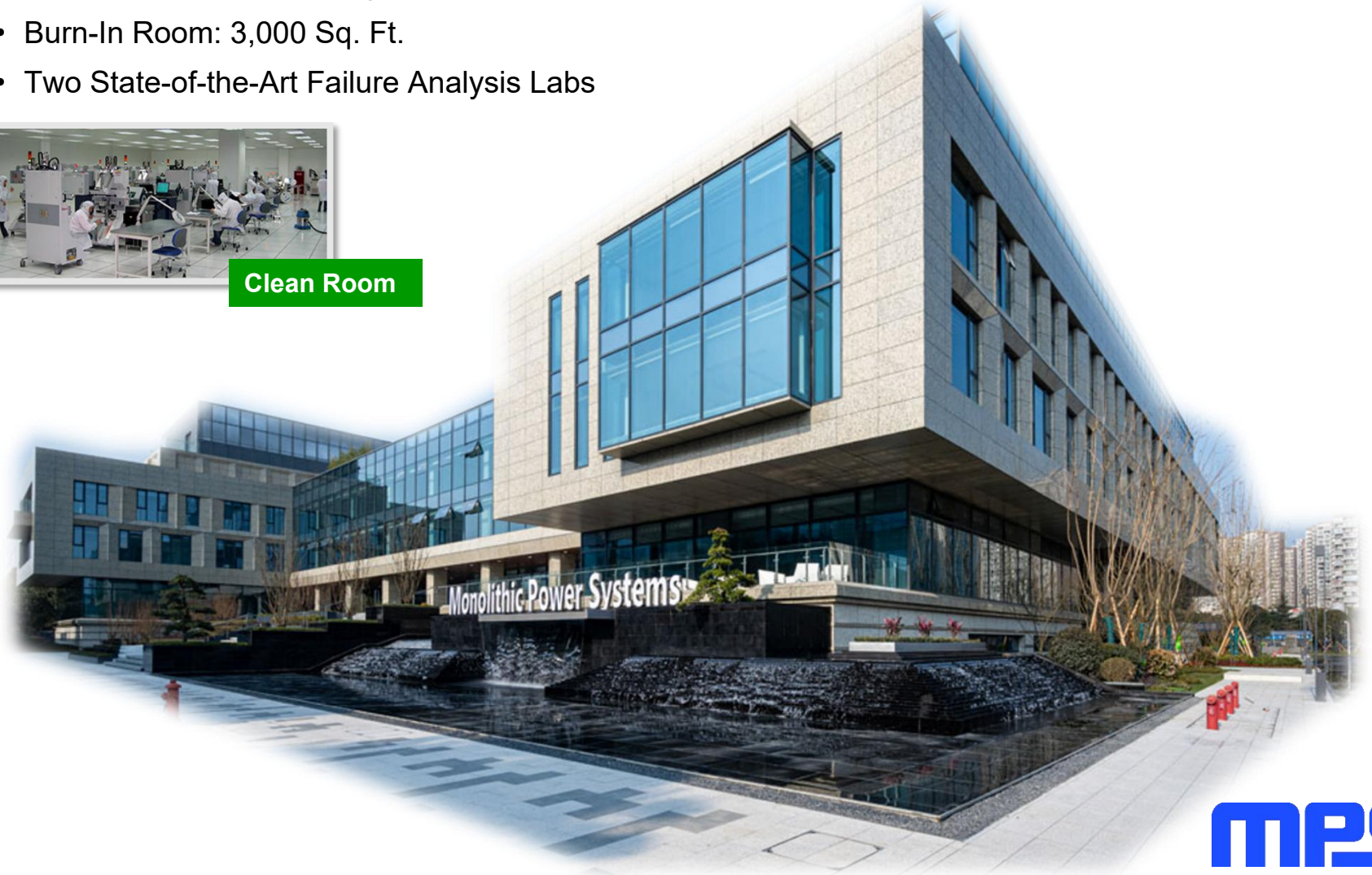
|             |        |         |
|-------------|--------|---------|
| SMIC        | China  | 8", 12" |
| HHGrace     | China  | 8"      |
| ASMC        | China  | 8"      |
| Key Foundry | Korea  | 8"      |
| TSMC        | Taiwan | 8"      |

## Quality/Reliability Facilities

- Both San Jose and Chengdu
- Burn-In Room: 3,000 Sq. Ft.
- Two State-of-the-Art Failure Analysis Labs



Clean Room



Chengdu, China Campus

# MPS Product Families

## AC/DC Power Conversion

- High-Voltage Buck Regulators
- High-Voltage LDOs
- Flyback Controllers
- Flyback Synchronous Rectifiers
- Active PFC Controllers
- LLC Resonant Converter Controllers
- LLC Synchronous Rectifiers
- PFC & LLC Combo Controllers
- X Capacitor Bleeders

## DC/DC Power Conversion

- Step-Up (Boost)
- Step-Down (Buck)
- Buck/Boost
- CPU Core Power
  - 50A DrMOS in a QFN (5mmx5mm) Package
- Power Magnetics
  - Molded Inductors
  - Semi-Shielded Inductors

## Battery Management

- Li-Ion Single and Multi-Cell
- USB-Complaint Chargers
- Switching Chargers
- Linear Chargers
- Integrated Power Bank Solutions

## Class-D Audio

- Analog Input Class-D Amplifiers
- PWM Input Power Stages

## Display Backlighting Power

- Backlight Drivers
- Electroluminescent Drivers
- Photo Flash Drivers
- LCD Power Supplies

## E-Fuse, USB & Load Switches

- Programmable Current Limit Up to 50A per Device
- Adjustable Slew Rate
- Reverse Current Blocking
- Output Discharge (Load Switch)
- Integrated Auto-Detection
- Pin Compatible
- Parallelable Up to 10 Devices
- PMBus Command and Control

## Automotive & Industrial

- AEC-Q100
  - DC/DC
  - LED Lighting
  - Power Modules
  - Motor Drivers
  - USB Charging
  - Display Backlighting
  - Precision Analog

## LED Lighting & Illumination

- TRIAC Dimmable AC/DC LED Controllers
- PWM and Analog Dimmable AC/DC LED Controllers
- DC/DC LED Controllers: Buck, Boost, & Buck-Boost
- LED Protection ICs

## Computing Power

- CPU Core Power
- High-Current DrMOS
  - 60A DrMOS in a QFN (4mmx5mm) Package
- POL

## Motor Drivers, Position, Current Sensors

- Brushless DC & Stepper Motor Drivers
- Brushed DC Motor/Solenoid Drivers
- Half-Bridge/Full-Bridge/Three-Phase Power Stages
- Magnetic Angular Position Sensors
- 5A-50A Current Sensors

## Power Modules

- 6V, 600mA to 4A
- 16V, 600mA to 60A
- 21V, 600mA to 2A
- 36V, 600mA to 5A
- 55V, 1A to 3A
- 75V, 300mA

## Precision Analog

- Analog-to-Digital Converters
- Analog Switches
- Current-Sense Amplifiers
- Operational Amplifiers
- Voltage Reference

# MPS高性能无刷BLDC及伺服方案分享

## 应用市场

网络安全



机器人



医疗传动



门闸机



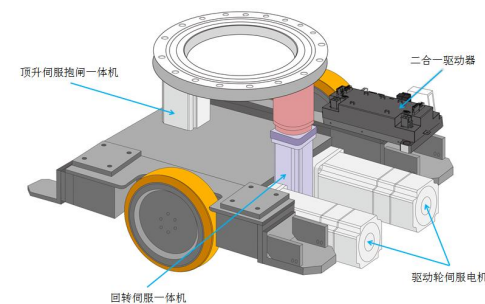
线性驱动器



纺织领域



物料分拣



一体机



# MPS高性能无刷BLDC及伺服方案分享

## 芯片组

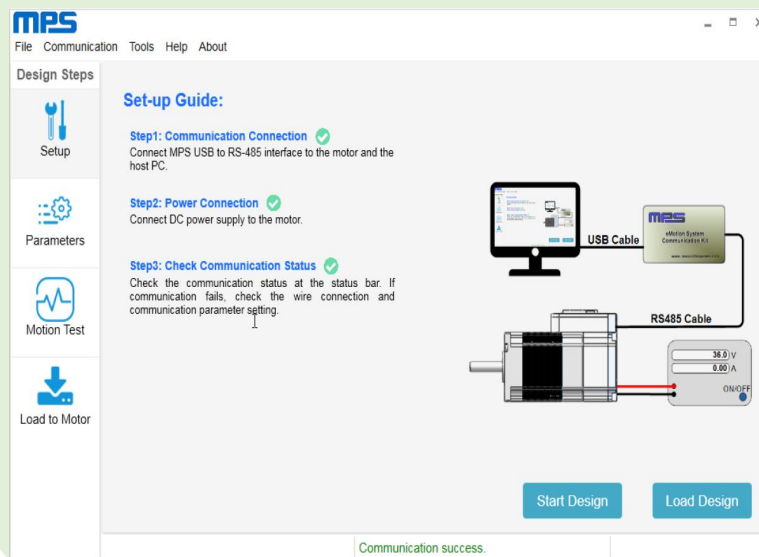


- 高性能**BLDC**伺服驱动器
- 高精度位置角度传感器
- 高集成度功率器件及驱动
- 业界领先降压和**LDO**芯片

## GUI应用界面



- 简单易用在线调试界面



## 应用设计团队



- 高效，专业技术支持
- 应用案例参考



# MP6710 + MP6571 方案架构

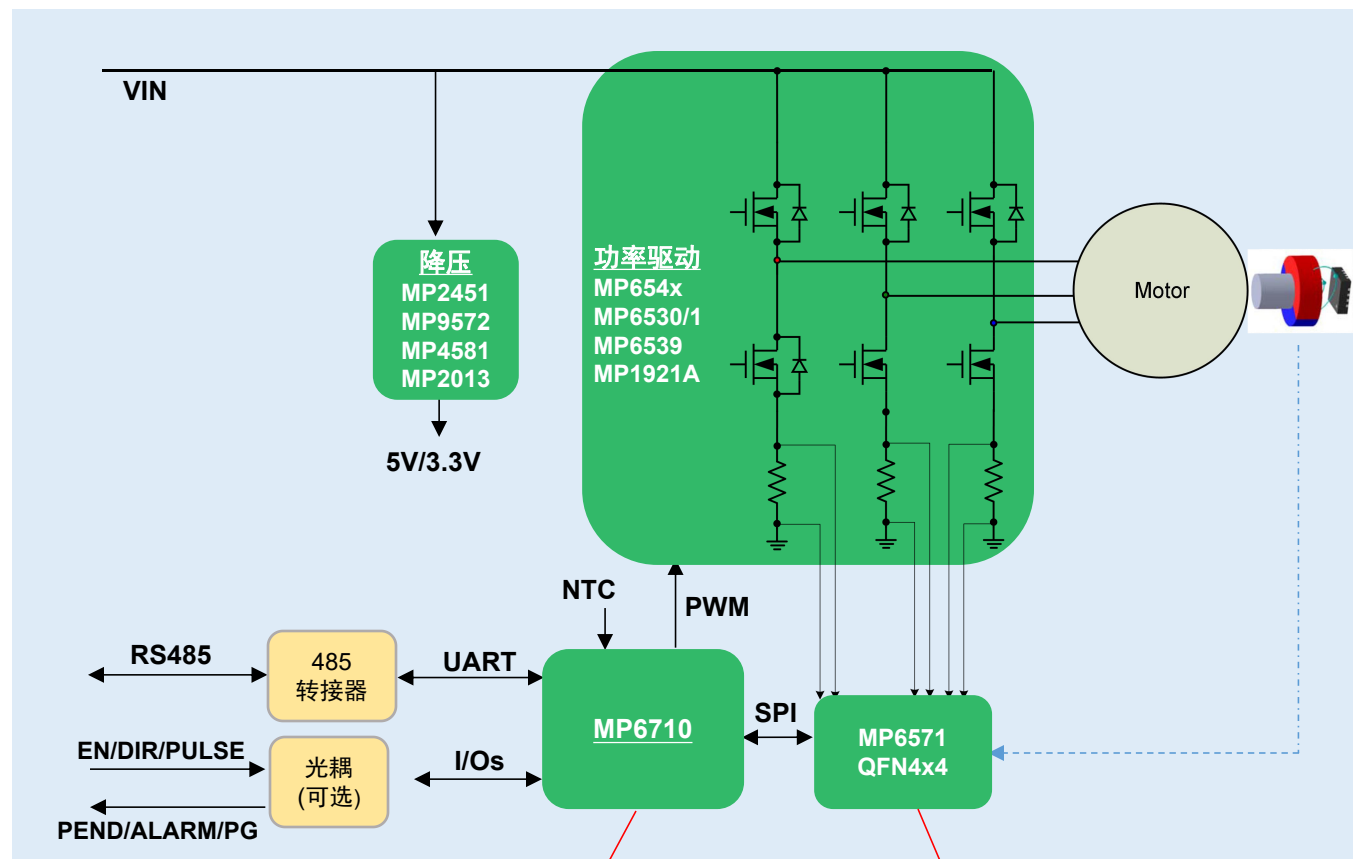
## ■ 功能

- 控制接口:
  - RS485/Modbus
  - PUL/DIR, PWM/DIR, A/B inputs
- 位置、速度、转矩模式:
  - 动态响应好，灵活切换平稳切换
- S-Curve指令平滑
- 12位绝对值位置编码器
- 可编程I/Os:
  - Input: DIR, PULSE, EN
  - Output: PEND, ALARM, PG,
- NTC PCB温度监测
- 可编程电子齿轮比
- 丰富保护功能
  - 输入电压监测，过流，过温，堵转，欠压

## ■ 应用特点

- 小体积，小尺寸电机
- 简化设计

## 系统结构

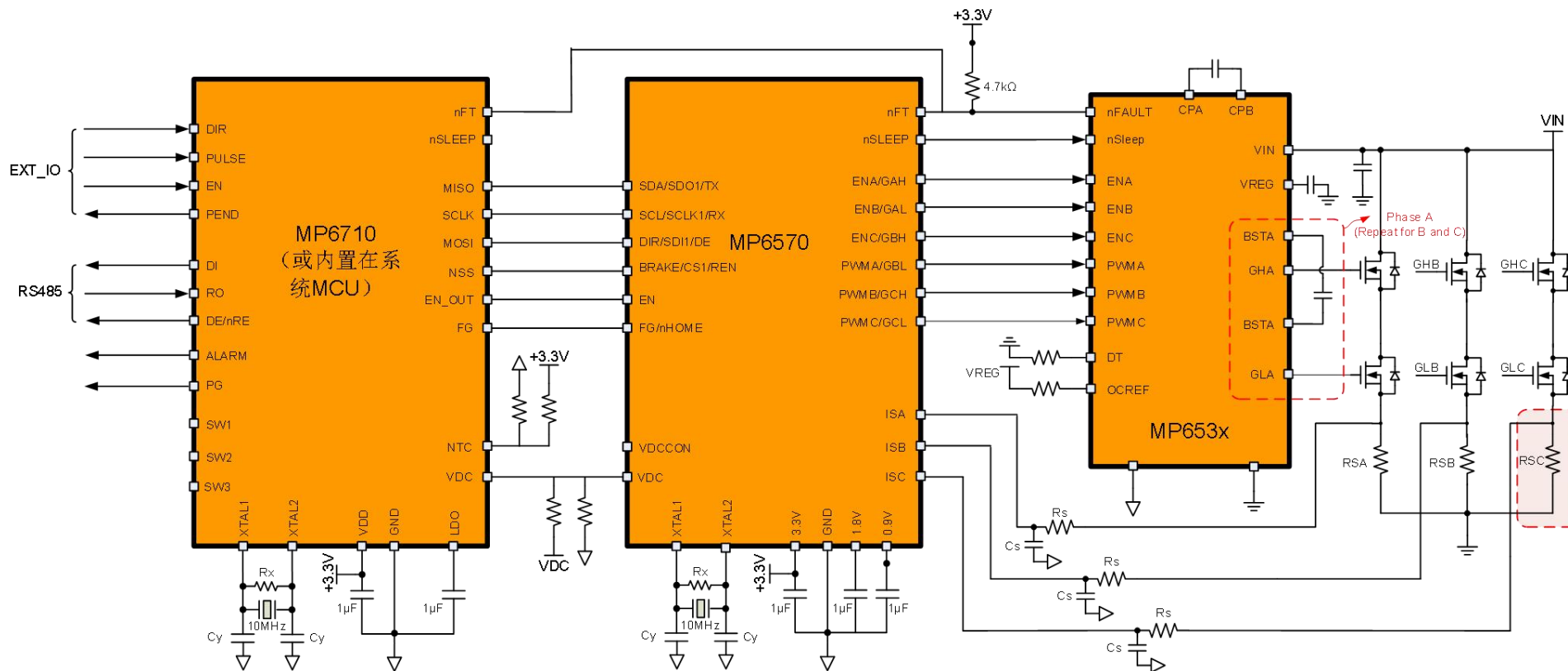


- 外环、I/O及协议处理
- 可提供Firmware系统方便应用

- 集成12编码器
- 3-ch运放
- FOC及SVPWM
- 转矩控制

# MP6710 + MP6571 方案架构

## ■ 原理设计参考





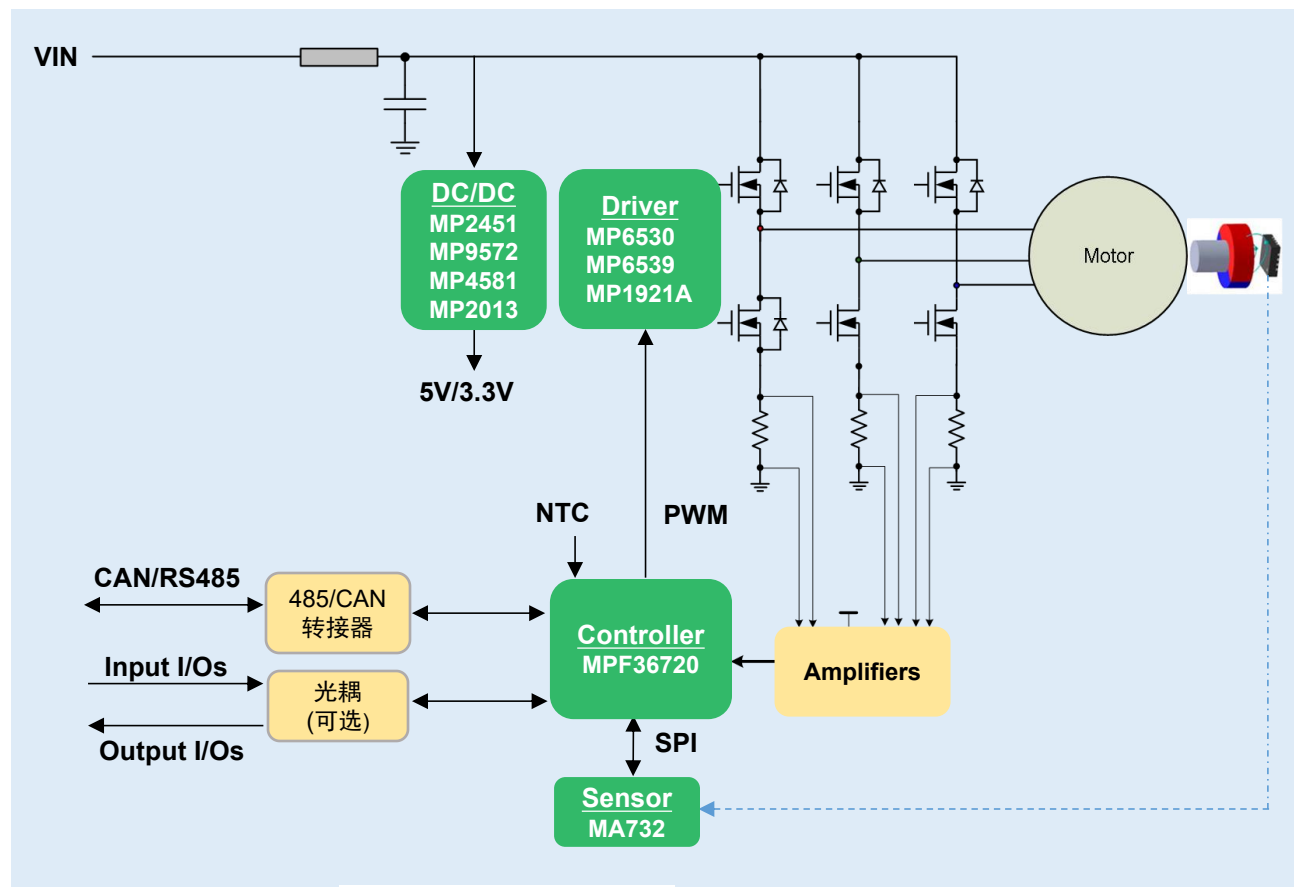
# MPF36720+MA732方案架构

- 搭配100V功率器件及驱动
- 低噪声高精度14位绝对值编码器
- 高效率降压及LDO芯片
- 高性能通用伺服控制器
  - RS485/Modbus, CAN/CANOpen
  - PUL/DIR, PWM/DIR, A/B 输入
  - 便准CiA DSP402 应用子协议:
    - PP, PV, PT, Homing, CSP, CSV, CST
    - 机器人应用转矩及位置控制模式
  - S-Curve指令平滑
  - 电机负载参数自识别及环路自动优化
  - 可编程输入I/Os: EN/DIR/PULSE/HOME Enable/Positive Switch /Negative Switch/Home Switch
  - 可编程输出I/Os: PEND/ALARM/BRAKE
  - 2x 陷波滤波器
  - NTC PCB温度监测
  - 可编程电子齿轮比
  - 丰富保护功能
    - 输入电压监测, 过流, 过温, 堵转, 欠压

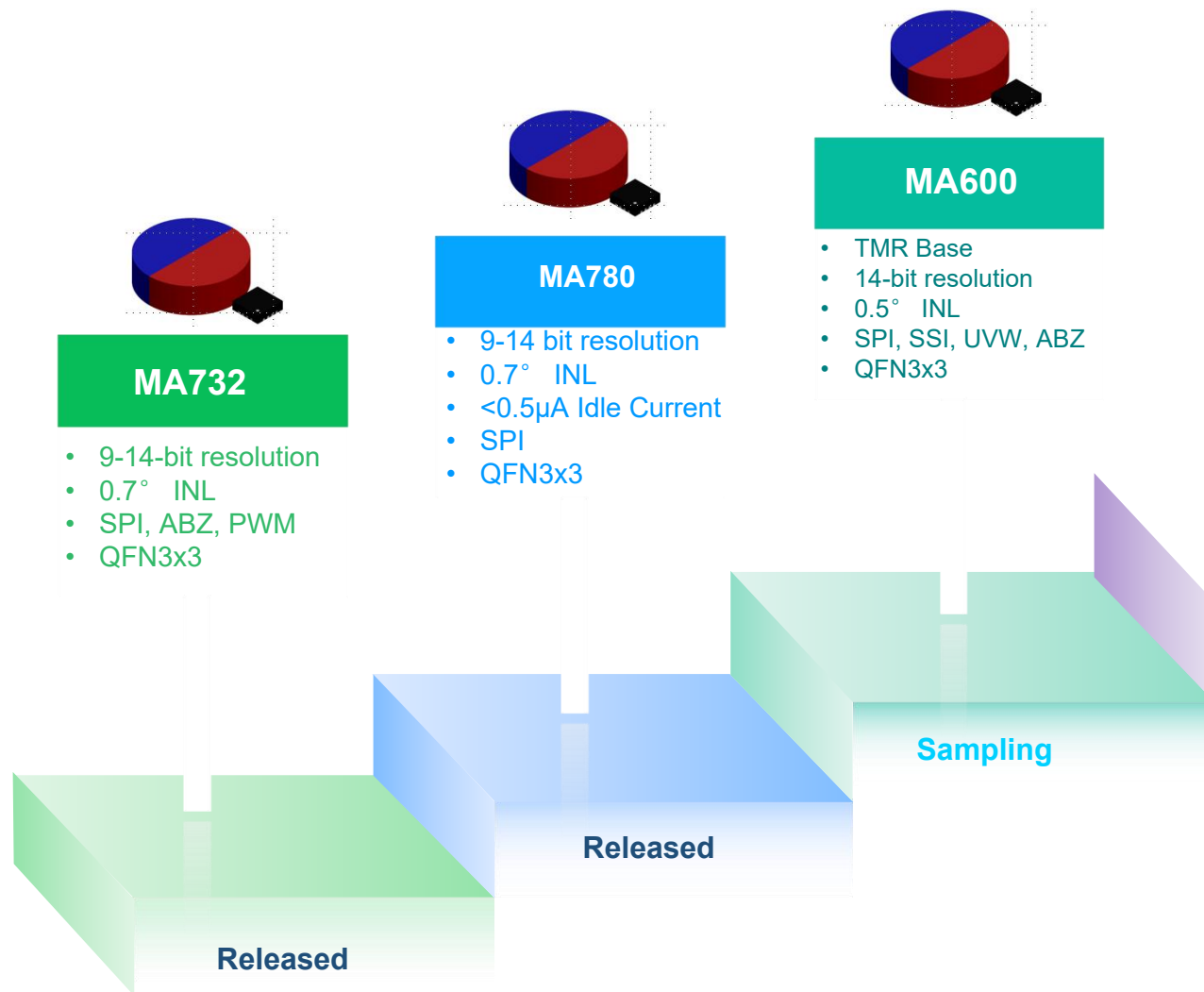
## ■ 应用特点

- 通用无刷伺服领域
- 12V-75V宽范围输入
- 简化设计, 缩短开发周期

## ■ 系统结构



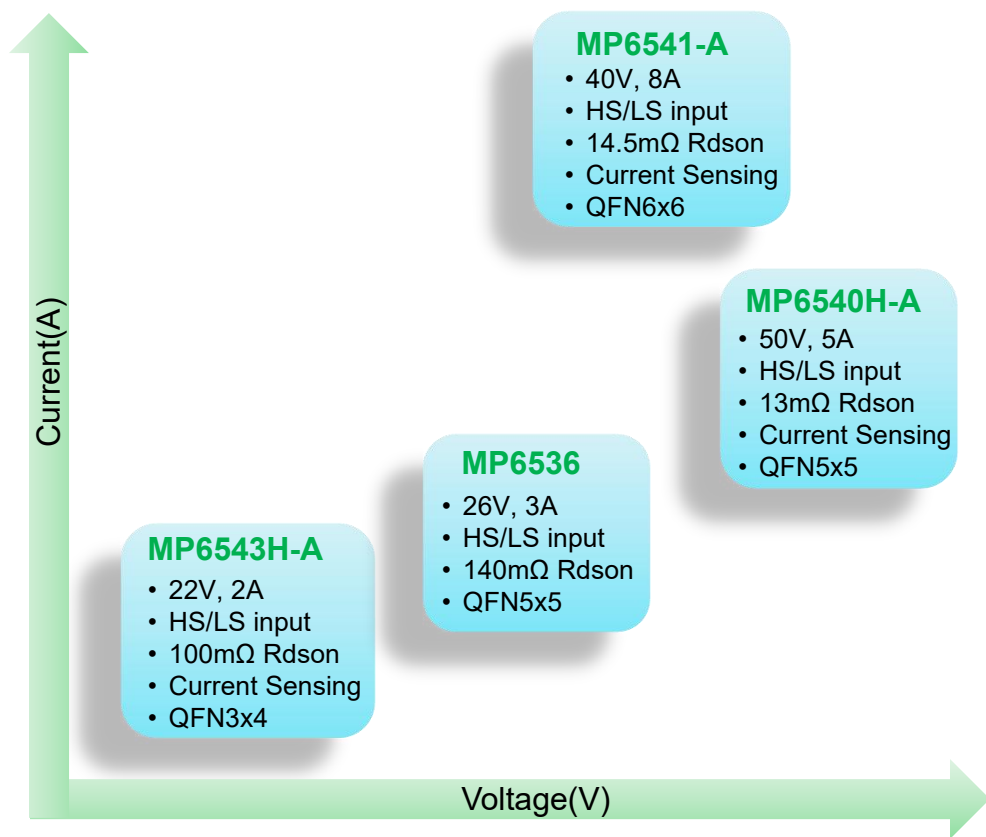
# 位置传感器



# 功率器件及驱动

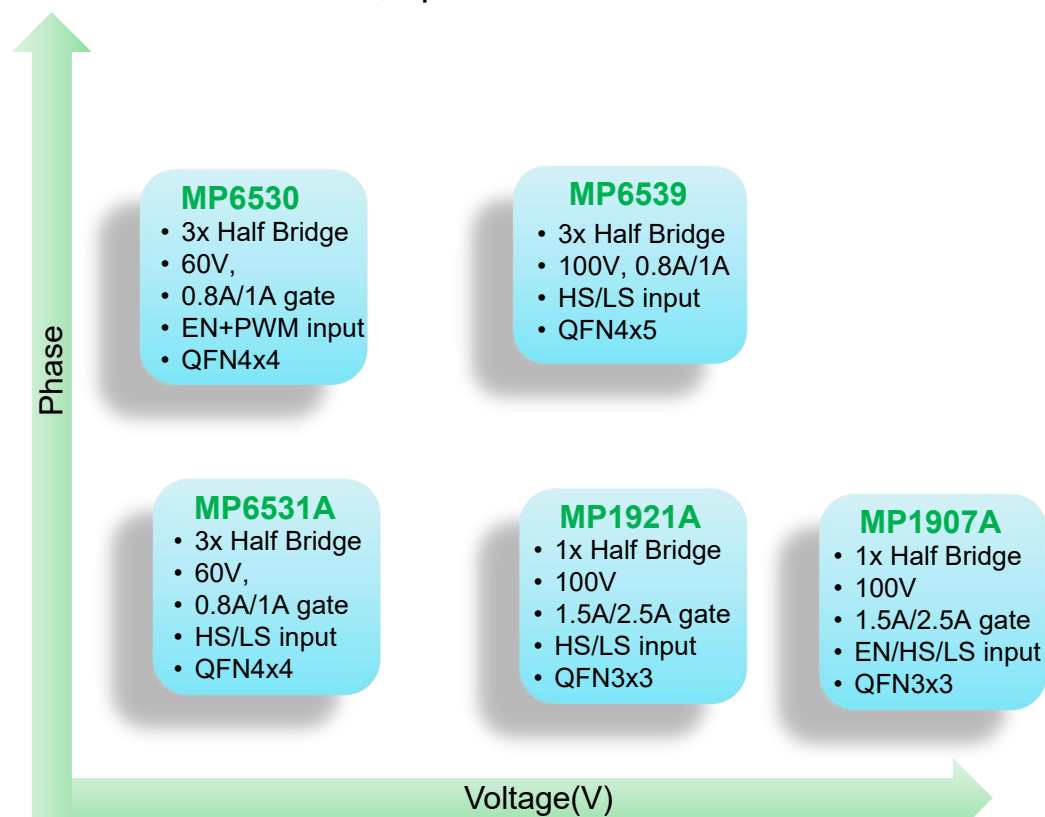
## ■ MOSFETs 全集成方案

- 集成驱动+功率+电流感应输出
- 高达8A电流
- 高达50V电压



## ■ Pre-Driver + MOSFETs

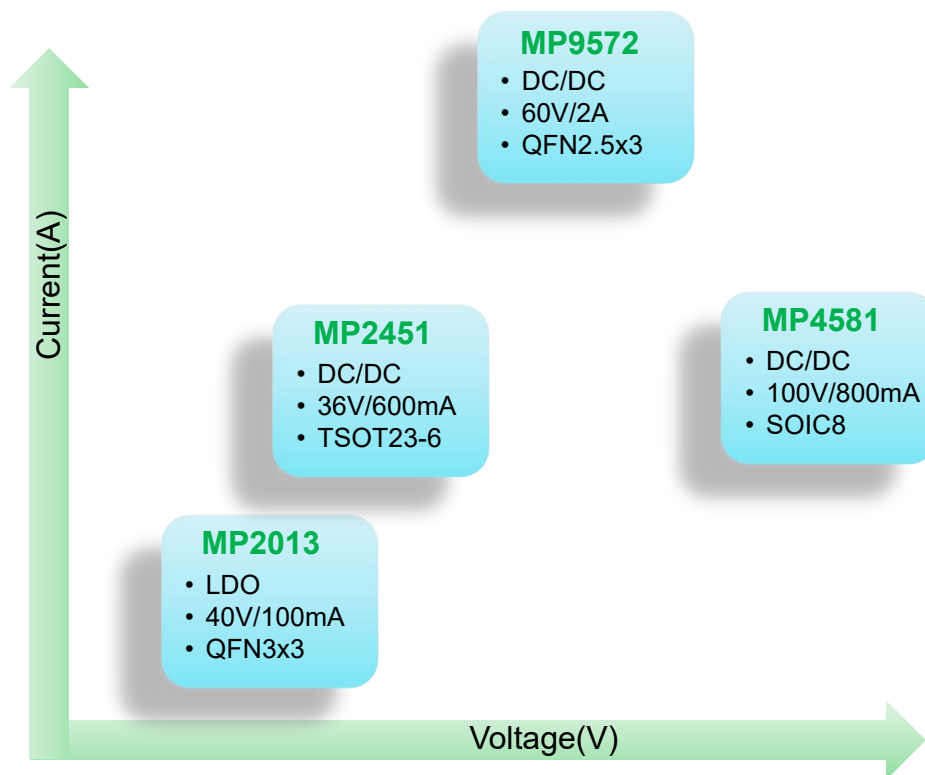
- 接口灵活, 可靠, 高驱动电流, 产品系列齐全
- **MP653x:**
  - 3x 半桥, up to 100V
- **MP192x:**
  - 1x半桥, up to 100V



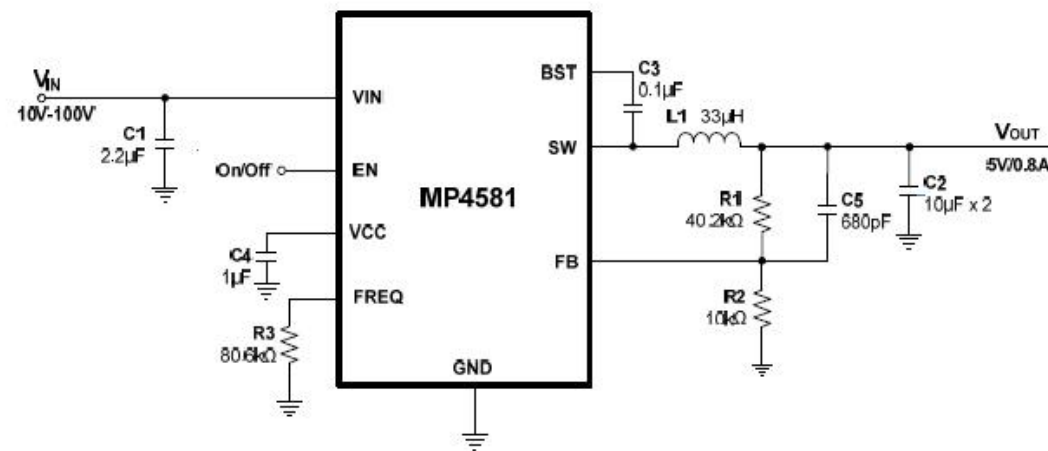
# 降压电源管理芯片

## ■ 降压Buck及LDO:

- 高效率, 高性价比
- **MP4581/MP4569**, up to 100V
- **MP2013**: LDO, up to 40V



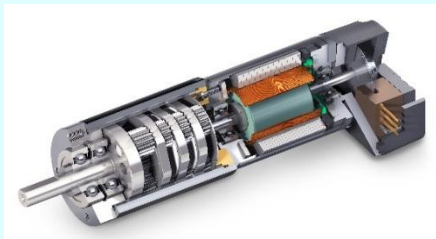
## Example Circuit



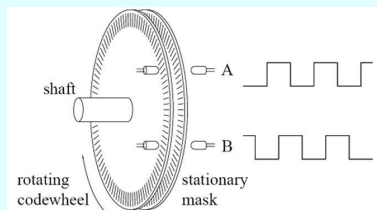


# 样机参考设计

## Traditional Solution



Motor



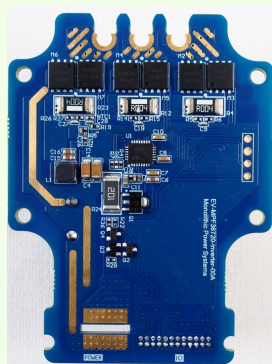
Encoder



Driver



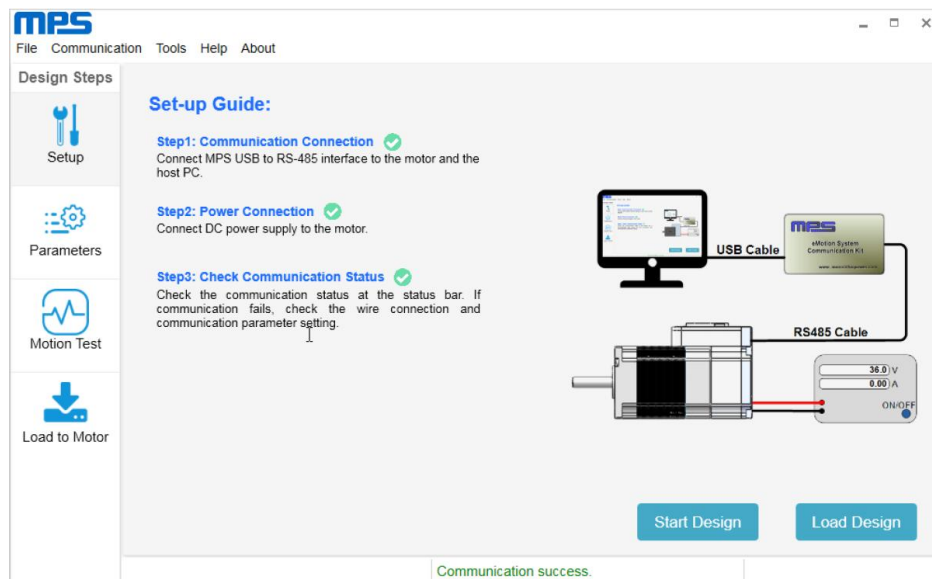
## MPS Solution



- ✓ 节省空间, 高功率密度
- ✓ 一体全集成可靠, 使用方便
- ✓ 方便引线, 使用方便

# GUI用户界面

## □ 简单，易用用户界面



✓ 向导模式方便设计.

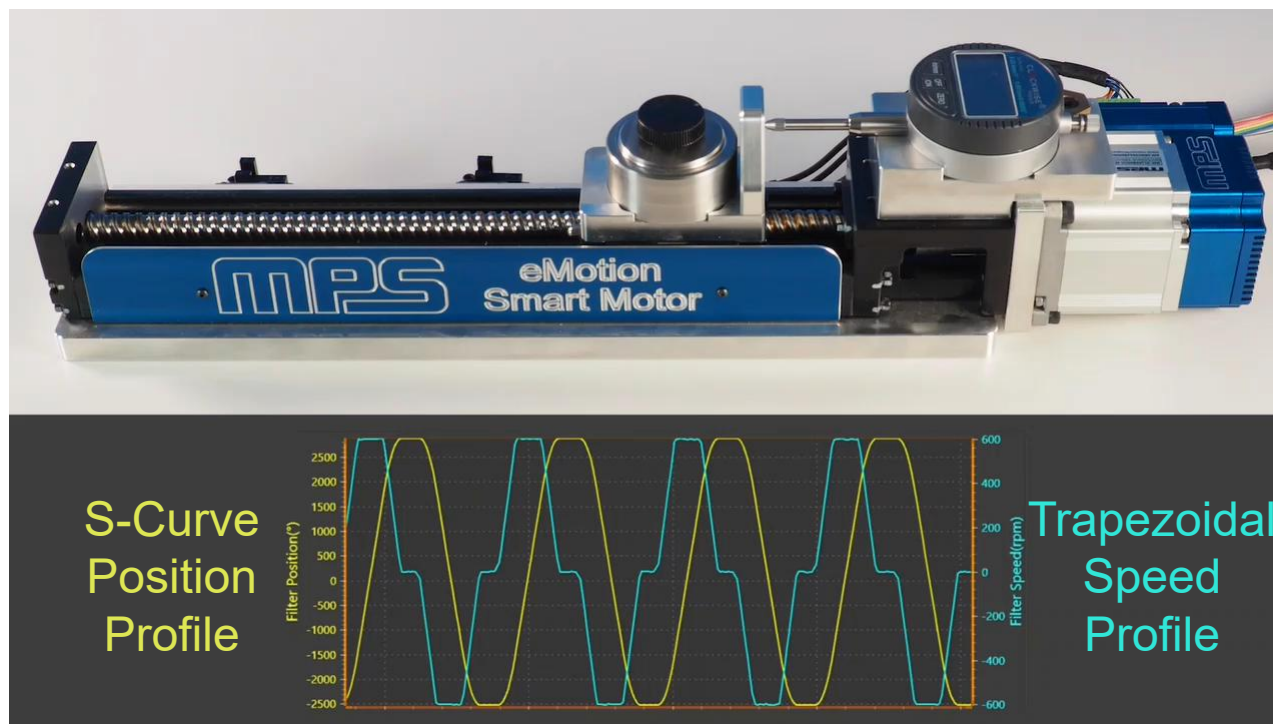


✓ 在线调试，状态监测

# 性能展示

## □ S曲线指令平滑

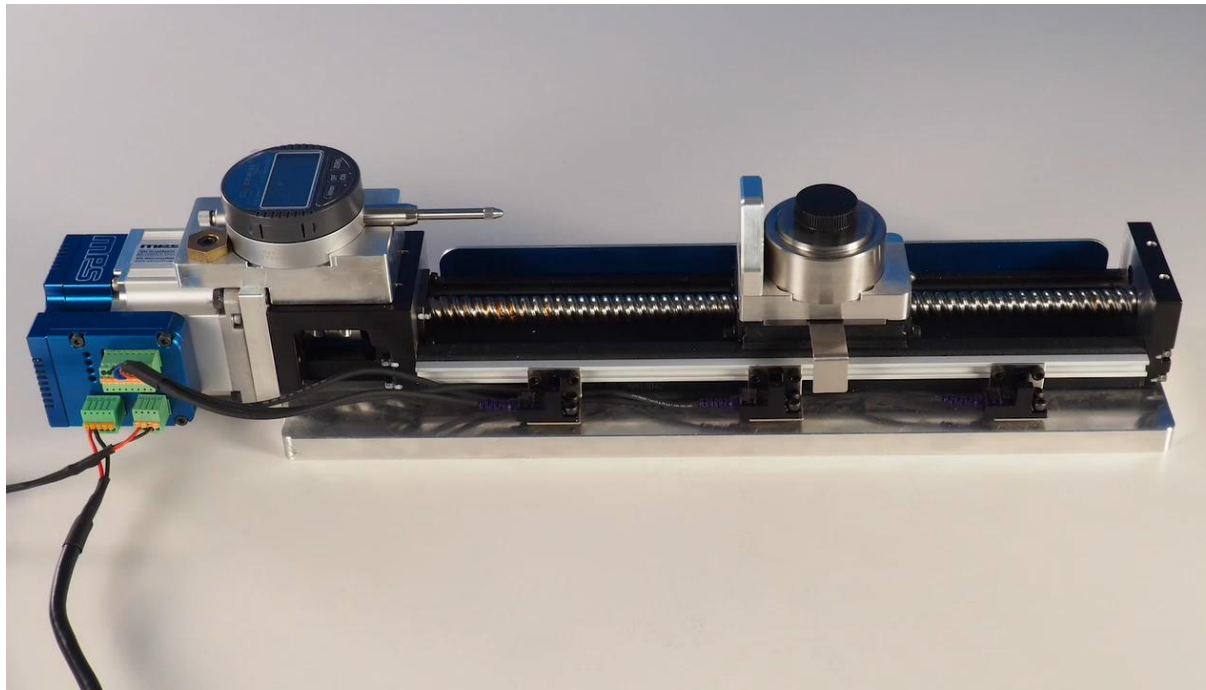
*S-Curve Position Profile: Smooth and Accurate!*



# 性能展示

## □ 标准原点Homing模式及cia402协议

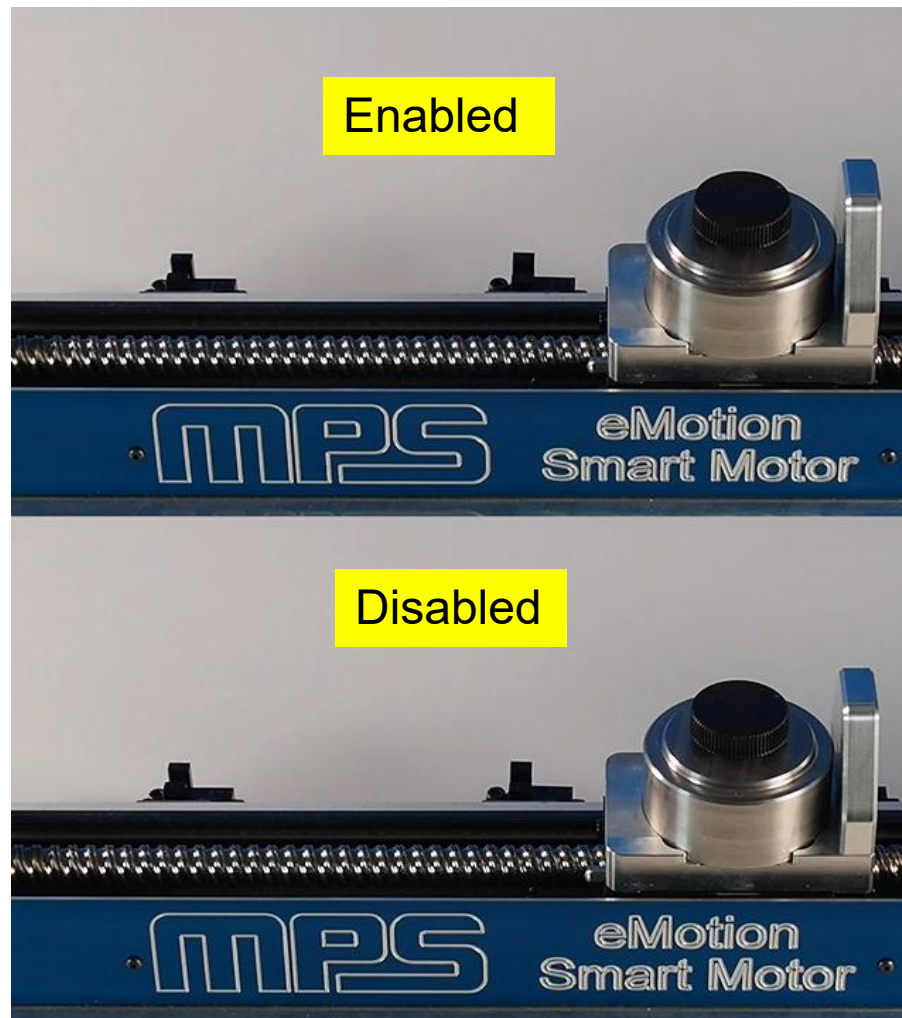
*Industrial Standard Homing Mode following Cia402 profile!*



# 性能展示

## □ 参数自识别，自动环路优化

*Automatic parameter identification and loop auto-tuning!*

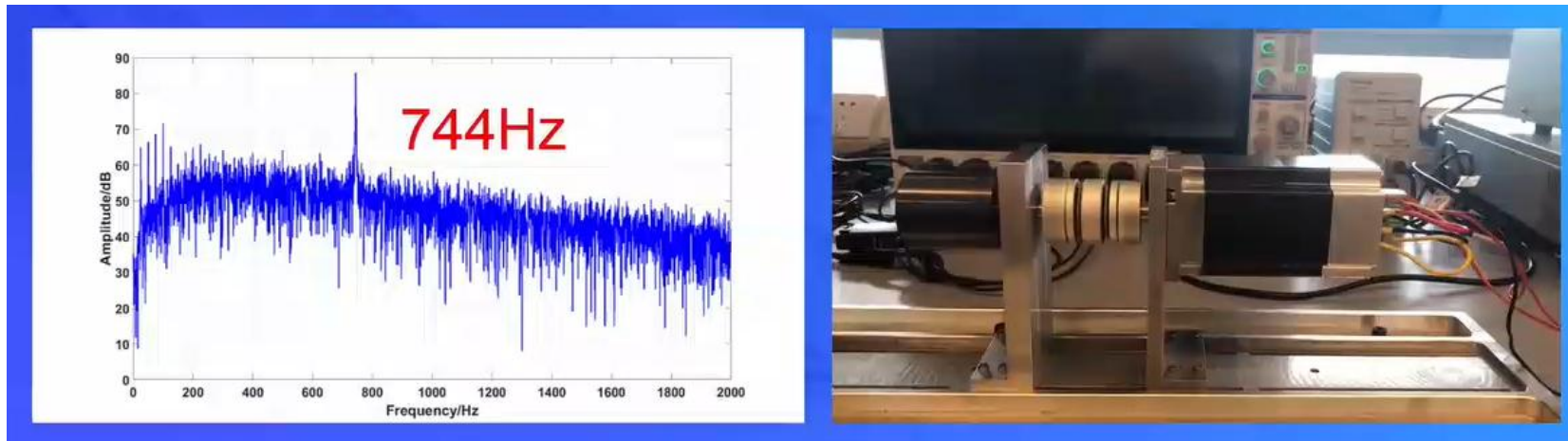




# 性能展示

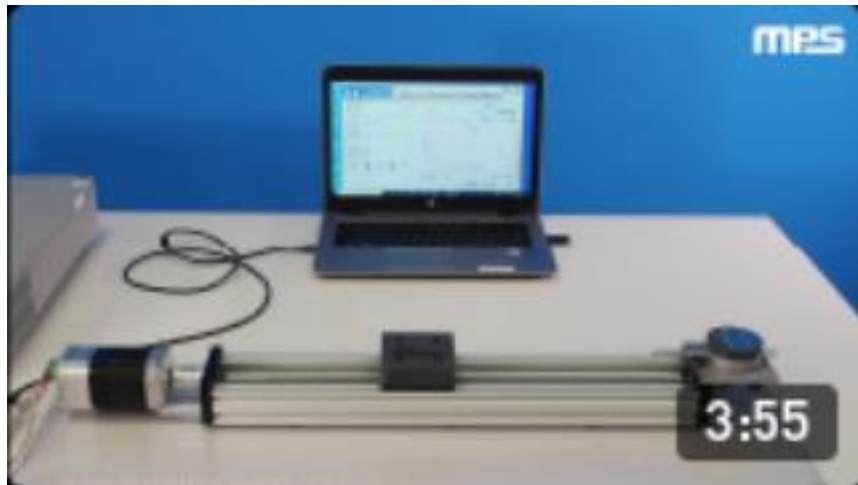
## ❑ 陷波滤波器

*Notch Filter To improve Elastic Load Performance!*



# 展示平台参考

More demo available on [www.monolithicpower.com](http://www.monolithicpower.com)



**Controlling a Linear Actuator with a High Performance BLDC Motor**



**Motion Control with MPS 2-axis BLDC motor**

谢谢！