

# Motor Driver and Position Sensor Solutions

Stepper, Brushless DC, Brushed DC Servo Motors,  
and Solenoids



Monolithic Power Systems, Inc.

**MPS**  
Simple, Easy Solutions™

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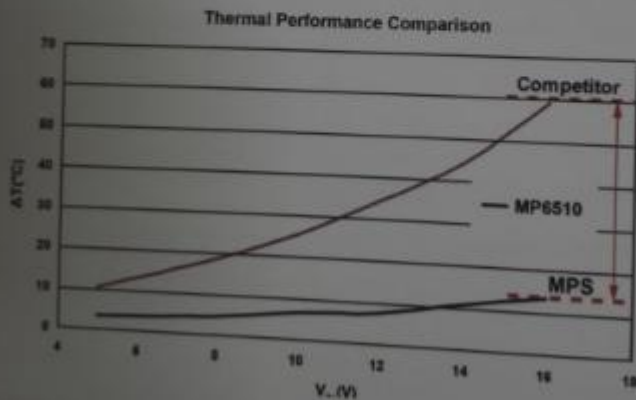


# MPS Motor Drivers

MPS motor drivers solutions offers a wide range of high-performance, cost-effective, and reliable solutions for stepper motors, brushless DC motors, brushed DC motors, and solenoids. Using the industry leading semiconductor process and advanced packaging technologies, MPS motor drivers achieve the highest efficiency, best thermal performance, and smallest solution size.

MPS' proprietary Fourth Generation BCD™ process technology is the key to its competitive advantage. Many conventional analog technologies are handicapped by an inability to support the integration of power devices at high power levels. This results in unacceptably large semiconductors and/or significant levels of power loss. High power loss results in significant heat dissipation. This must be managed to avoid damaging or reducing the overall performance and efficiency of the system.

## Better Thermal Performance ( $T_a = 25^\circ\text{C}$ )



$\Delta = 46^\circ\text{C}$

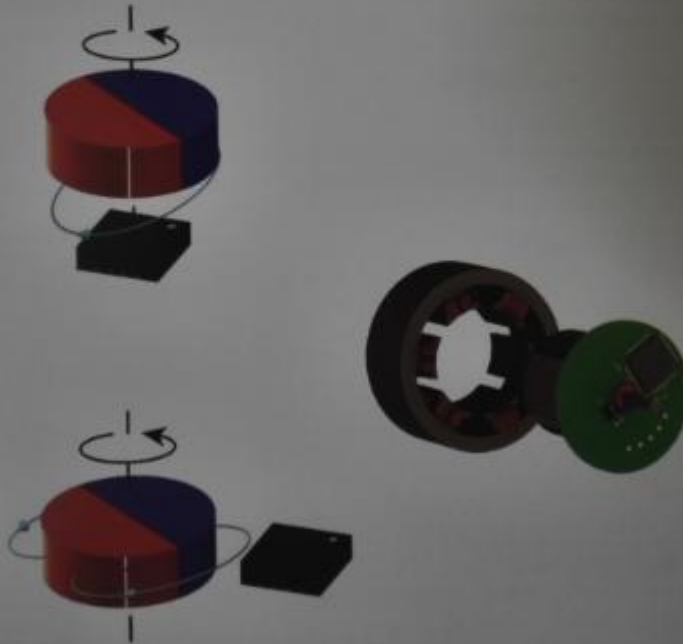
## MPS Position Sensors

MPS offers a revolutionary new way for magnetic sensors to directly measure angles. By leveraging more than a decade of research and development, we are able to provide unique performance capabilities and have become a technology leader in magnetic sensing.

MPS position sensors are based on unique measurement technology that are integrated directly with the signal conditioning. Our MagAlpha family can detect and deliver the angle value in digital format instantaneously without having to calculate the shaft position.



Conventional systems obtain the angle by using complex calculations of feedback loops with long time constants. MagAlpha uses a straightforward way to measure the angle without the need of analog to digital conversion or feedback loops. It yields instant information about the actual rotor position.



# Complete MPS Motor Driver Solutions

## Stepper Motor Solutions

### MP6500 Solution Kit (EVKT6500) \$99

- Simple solution kit for the MP6500 stepper motor driver with internal current sense
- Connect to power, a bipolar stepper motor, and a pulse generator
- Small size: 30x35mm



### MP6501A Solution Kit (EVKT6510A) \$119

- Solution kit for the MP6501A stepper motor driver
- Built-in microcontroller and USB interface connects with the included easy-to-use Windows GUI
- Can also be controlled externally



## Brushless DC Motor Solutions

### MP6530 Solution Kit (EVKT6530) \$119

- Solution kit for the MP6530 3-phase pre-driver to drive a brushless DC motor
- Microcontroller with open-loop speed control and Hall commutation built in
- 3mΩ FETs on-board can drive up to 60V, 15A motors



### MP6532 Solution Kit (EVKT6532) \$119

- Solution kit for the MP6532 3-phase pre-driver with Hall sensor inputs
- Microcontroller with open-loop PWM speed control built-in
- 3mΩ FETs on-board can drive up to 60V, 15A motors



## Brushed DC Motor and Solenoid Solutions

### MP6513 Solution Kit (EVKT6513) \$79

- Simple solution kit for the MP6513 H-bridge motor driver
- Open-loop PWM speed control built-in
- Small size: 30x35mm



### MP6515 Solution Kit (EVKT6515) \$79

- Simple solution kit for the MP6515 H-bridge motor driver
- Open-loop PWM speed control built-in
- Small size: 30x35mm



## Stepper Motor Drivers

A stepper motor allows for precise position control without the need for a feedback system. It is widely used in open-loop position control systems. MPS stepper motor drivers are optimized to drive bipolar stepper motors used in printers, document scanners, office/factory automation, security system, scientific, and medical equipment.

### Features

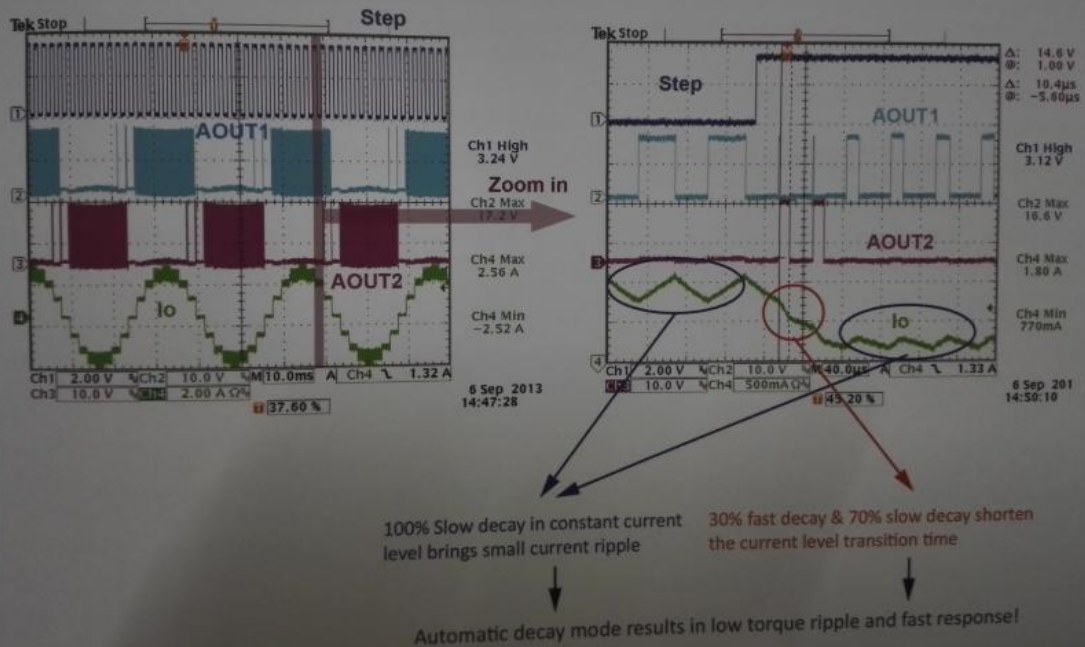
- Two Internal Full-Bridge Drivers
- Stepper Indexer or Parallel Control
- Low On Resistance
- No Control Supply Required
- Sink and Source Over-Current Protection
- Thermal Shutdown and UVLO Protection
- Thermally-Enhanced Packages
- High Breakdown Voltage



# Stepper Motor Drivers

Part Number	Description	Min Input (V)	Max Input (V)	Max Current (A)	Step Mode	Control Interface	Other Features	Status
MP6506	15V, 0.5A Bipolar Stepper Motor Driver	2.7	15	0.5	Full, Half	Parallel	-	Released
MP6507	15V, 0.7A Bipolar Stepper Motor Driver	2.7	15	0.7	Full, Half	Parallel	-	Released
MP6508	18V, 1.2A Bipolar Stepper Motor Driver	2.7	18	1.2	Full, Half	Parallel	-	Released
MP6509	18V, 1.2A Bipolar Stepper Motor Driver with Current Attenuation	2.7	18	1.2	Full, Half	Parallel	Current Attenuation	Released
MP6520	35V, 1.3A Bipolar Stepper Motor Driver with Micro-Stepping	8.5	35	1.2	Full, Half, Quarter, Eighth	Indexer	-	Call Factory
MP6518	35V, 1.5A Bipolar Stepper Motor Driver with Micro-Stepping	8.5	35	1.5	Full, Half, Quarter, Eighth	Indexer	-	Released
MP6501A	35V, 2.5A Bipolar Stepper Motor Driver with Micro-Stepping	8.5	35	2.5	Full, Half, Quarter, Eighth	Indexer	-	Released
MP6500	35V, 2.8A Bipolar Stepper Motor Driver with Micro-Stepping and Internal Current Sense	8.5	35	2.8	Full, Half, Quarter, Eighth	Indexer	Internal Current Sense	Call Factory

## MPS Stepper Motor Drivers Advantages



## MPS Advantage

- Low on resistance significantly improves thermal performance
- Smooth torque and accurate stepping control
- Extensive protection functions increase system reliability



# Brushed DC Motor and Solenoid Drivers

A brushed DC motor is a mechanically commutated motor running from a DC power source. It's widely used in consumer and industrial applications due to its simplicity and cost-effectiveness. MPS H-bridge drivers are designed to drive brushed DC motors and solenoids in consumer appliances, toys, automotive, and industrial applications.

## Features

- Integrated Half-/Full-Bridge Drivers
- Low On Resistance
- Internal Charge Pump
- Low Quiescent/Sleep Current
- Over-Current and Over-Temperature Protections
- Thermally Enhanced Packages

## MPS Advantage

- Low on resistance significantly improves thermal performance
- Wide input range to support different applications
- Extensive protection functions increase system reliability

Part Number	Description	Min Input (V)	Max Input (V)	Number of Half-Bridges	Output Current (A)	Control Interface	Other Features	Status
MP1000	15V, 0.5A Dual Full-Bridge Driver	2.7	15	4	0.5	PWM	-	Released
MP1007	15V, 0.7A Dual Full-Bridge Driver	2.7	15	4	0.7	PWM	-	Released
MP1022	24V, 0.8A Full-Bridge Driver	2	24	2	0.8	PWM	-	Call Factory
MP1024	24, 0.8A Full-Bridge Driver	2	24	2	0.8	Hi/Low	-	Call Factory
MP10223	40V, 0.9A, Triple Half-Bridge Driver	7	40	3	0.9	SP	-	Call Factory
MP10226	40V, 0.9A, Hex Half-Bridge Driver	7	40	6	0.9	SP	-	Call Factory
MP1028	18V, 1.2A, Dual Full-Bridge Driver	2.7	18	4	1.2	PWM	-	Released
MP1028	18V, 1.2A, Dual Full-Bridge Driver with Current Attenuation	2.7	18	4	1.2	PWM	Current Attenuation	Released
MP10213	30V, 2.8A, Full-Bridge Driver with Internal Current Sense	8	35	2	2.8	PWM	Internal Current Sense	Call Factory
MP10219	30V, 2.8A, Full-Bridge Driver with Internal Current Sense	8	35	2	2.8	Hi/Low	Internal Current Sense	Call Factory
MP1046	26V, 5A, Full-Bridge Driver	7.5	28	2	5	PWM	-	Released
MP1048	30V, 5.5A Dual Full-Bridge Driver	5	26	4	5.5	PWM	-	Released
MP1049	24V, 5A Half-Bridge Driver	7.5	24	1	5	PWM	-	Released

Part Number	Description	Min Input (V)	Max Input (V)	Number of Half-Bridges	Output Current (A)	Control Interface	Other Features	Status
MP6506	15V, 0.5A Dual Full Bridge Driver	2.7	15	4	0.5	PWM	-	Released
MP6507	15V, 0.7A Dual Full Bridge Driver	2.7	15	4	0.7	PWM	-	Released
MP6513	21V, 0.8A Full Bridge Driver	2	21	2	0.8	PWM	-	Call Factory
MP6514	21, 0.8A Full Bridge Driver	2	21	2	0.8	Hi/Lo	-	Call Factory
MPQ6523	40V, 0.9A, Triple Half-Bridge Driver	7	40	3	0.9	SPI	-	Call Factory
MPQ6526	40V, 0.9A, Hex Half-Bridge Driver	7	40	6	0.9	SPI	-	Call Factory
MP6508	18V, 1.2A, Dual Full-Bridge Driver	2.7	18	4	1.2	PWM	-	Released
MP6509	18V, 1.2A, Dual Full-Bridge Driver with Current Attenuation	2.7	18	4	1.2	PWM	Current Attenuation	Released
MP6515	35V, 2.8A, Full Bridge Driver with Internal Current Sense	8	35	2	2.8	PWM	Internal Current Sense	Call Factory
MP6516	35V, 2.8A, Full Bridge Driver with Internal Current Sense	8	35	2	2.8	Hi/Lo	Internal Current Sense	Call Factory
MP8046	28V, 5A, Full Bridge Driver	7.5	28	2	5	PWM	-	Released
MP8049S	26V, 5.5A Dual Full Bridge Driver	5	26	4	5.5	PWM	-	Released
MP8040	24V, 9A Half Bridge Driver	7.5	24	1	9	PWM	-	Released

## Product Highlights

# Brushless DC Motor Pre-Drivers

A brushless DC motor is an electronically commutated motor running from a DC source. Due to its high reliability and ruggedness, it has been used in many speed control system. MPS brushless DC motor pre-drivers are designed to drive high-power brushless DC motors used in various industrial, automotive, and consumer applications such as power tools, fans, pumps, E-bikes, and etc.

### Features

- Single or Triple H-Bridge MOSFET Pre-Drivers
- Wide Input Voltage Range
- Internal Charge Pumps
- Over-Current Protection
- Adjustable Dead Time to Prevent Shoot-Through
- Thermal Shutdown and UVLO Protection

## Brushless DC Motor Pre-Drivers

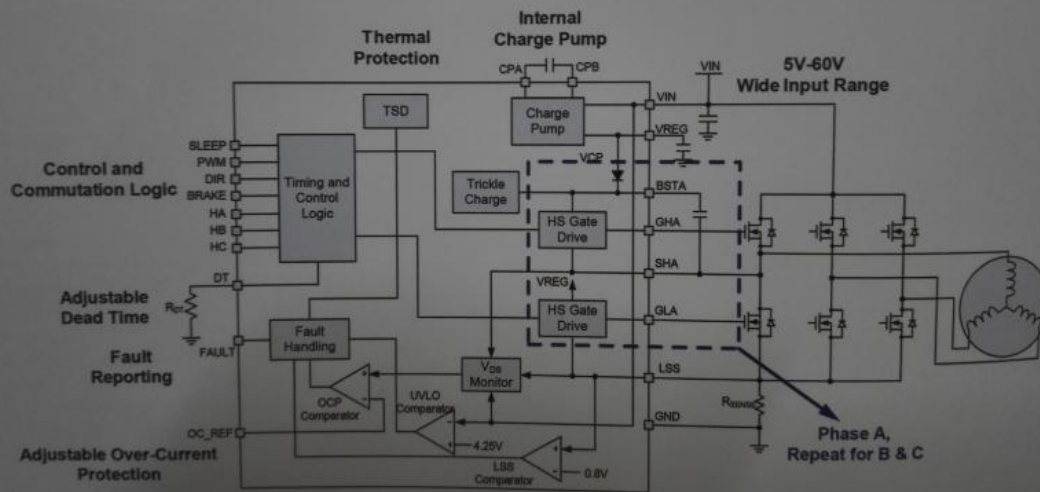
Part Number	Description	Min Supply (V)	Max Supply (V)	Max SW Voltage	Number of Half-Bridges	Sink/Source Current (A)	Hall Input	Other Features	Status
MP6530	60V 3-Phase BLDC Motor Pre-Driver	5	60	60	3	1/0.8	No	-	Released
MP6532	60V 3-Phase BLDC Motor Pre-Driver with Hall Input	5	60	60	3	1/0.8	Yes	-	Released
MP6534	60V 3-Phase BLDC Motor Pre-Driver with Buck Regulator	5	60	60	3	1/0.8	No	500mA Buck Regulator	Call Factory
MP6535	60V 3-Phase BLDC Motor Pre-Driver with Hall Input and Buck Regulator	5	60	60	3	1/0.8	Yes	500mA Buck Regulator	Call Factory
MP1921A	100V, 2.5A Half-Bridge Gate Driver	9	18	100	1	2.5/1.5	No	-	Released
MP1924	100V, 4.5A Half-Bridge Gate Driver	9	18	100	1	4.5/3	No	-	Released

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# Fan Drivers and Integrated BLDC Motor Drivers

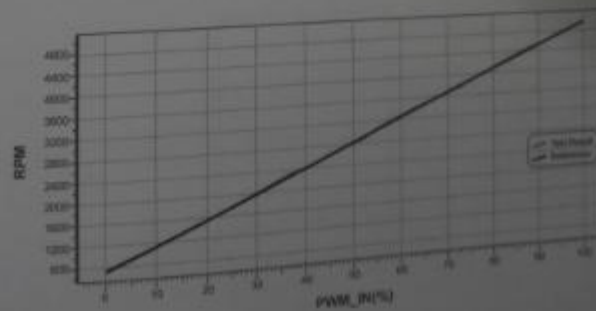
MPS fan drivers and integrated brushless DC motor drivers are optimized to single-phase brushless DC motors used in cooling fans that can be found in many electronic equipments such as personal computers, servers, work stations, and etc.

## Features

- Embedded hall sensor with high sensitivity
- Wide 3.3V to 18V operating input range
- Up to 0.6A continuous driver current
- Integrated power MOSFETs: total 850mΩ (H5+L5)
- Programmable speed curve
- Automatic phase lock detection of winding BEMF and current zero-crossing
- Soft on/off switching phase
- Rotational speed indicator FG signal
- 12kHz to 48kHz PWM input frequency range
- Fixed 27kHz output switching frequency
- Input line reverse voltage protection
- Locked-Rotor protection and automatic recovery
- Thermal protection and automatic recovery
- Built-in input OVP, UVLO and automatic recovery
- Available in a FCT50T23-6-SL Package



### Speed vs. PWM IN Curve



## Fan Drivers and Integrated BLDC Motor Drivers

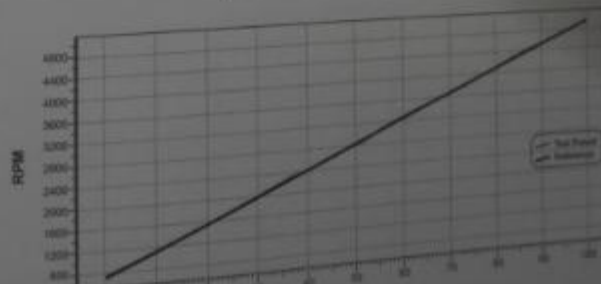
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Speed vs. PWM IN Curve



Product Highlights

## Fan Drivers and Integrated BLDC Motor Drivers

Part Number	Description	Min Input (V)	Max Input (V)	Number of Half-Bridges	Output Current (A)	Hall Input	Other Features	Status
MP6505	16V, 0.4A Single Phase BLDC Motor Driver	4.5	16	2	0.4	Yes	Speed Indicator, Locked Rotor Protection	Released
MP6510	16V, 0.6A Single Phase BLDC Motor Driver	4.5	16	2	0.6	Yes	Speed Indicator, Locked Rotor Protection	Released
MP6517	18V, 0.6A Single Phase BLDC Motor Driver with Hall Sensor and Full Programmability	3	18	2	0.6	No	Integrated Hall Sensor, Programmable Speed Curve, Locked Rotor Protection, Speed Indicator	Call Factory
MP9518	18V, 0.6A Single Phase BLDC Motor Driver with Hall Sensor	3	18	2	0.6	No	Integrated Hall Sensor, Speed Indicator, Locked Rotor Protection	Call Factory
MP6536	26V, 5A 3-Phase Power Stage	5	26	3	5.5	No	-	Released

Product Highlights

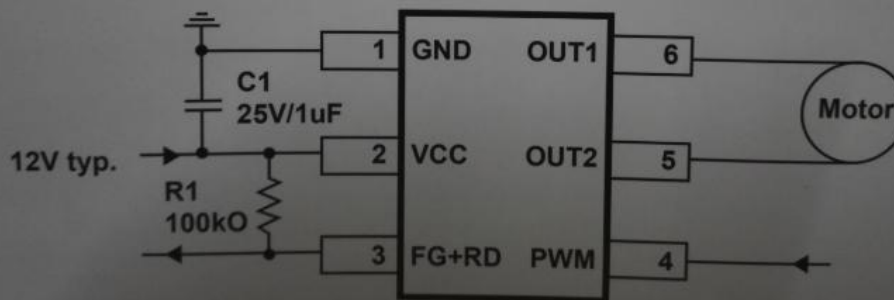
## Fan Drivers and Integrated BLDC Motor Drivers

Part Number	Description	Min Input (V)	Max Input (V)	Number of Half-Bridges	Output Current (A)	Hall Input	Other Features	Status
MP6505	16V, 0.4A Single Phase BLDC Motor Driver	4.5	16	2	0.4	Yes	Speed Indicator, Locked Rotor Protection	Released
MP6510	16V, 0.6A Single Phase BLDC Motor Driver	4.5	16	2	0.6	Yes	Speed Indicator, Locked Rotor Protection	Released
MP6517	18V, 0.6A Single Phase BLDC Motor Driver with Hall Sensor and Full Programmability	3	18	2	0.6	No	Integrated Hall Sensor, Programmable Speed Curve, Locked Rotor Protection, Speed Indicator	Call Factory
MP9518	18V, 0.6A Single Phase BLDC Motor Driver with Hall Sensor	3	18	2	0.6	No	Integrated Hall Sensor, Speed Indicator, Locked Rotor Protection	Call Factory
MP6536	26V, 5A 3-Phase Power Stage	5	26	3	5.5	No	-	Released

### MPS Advantage

- Low on resistance significantly improves thermal performance
- Wide input range to support different applications
- Extensive protection functions increase system reliability
- No need for external clamping devices

### Eliminates External Clamping Devices!



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## Position Sensors

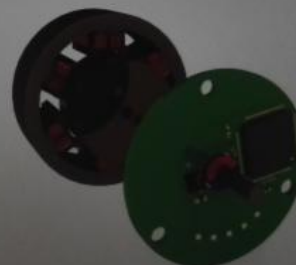
As magnetic angle sensors are now used widely in position control, these sensors are expected to respond accurately and rapidly. Monolithic Power Systems' MagAlpha position sensor technology is an innovative solution, which does not involve complex calculation or feedback loops with long time constraints. It measures the angle directly and yields accurate rotor position instantaneously.

### Features

- 11.5-Bit Resolution Absolute Angle Encoder
- 500kHz Refresh Rate
- Ultra-Low Latency: 3μs
- Serial Interface for Data Readout and Setting
- Built-In Linearization for Side-Shaft Mounting
- Low Supply Current

### MPS Advantage

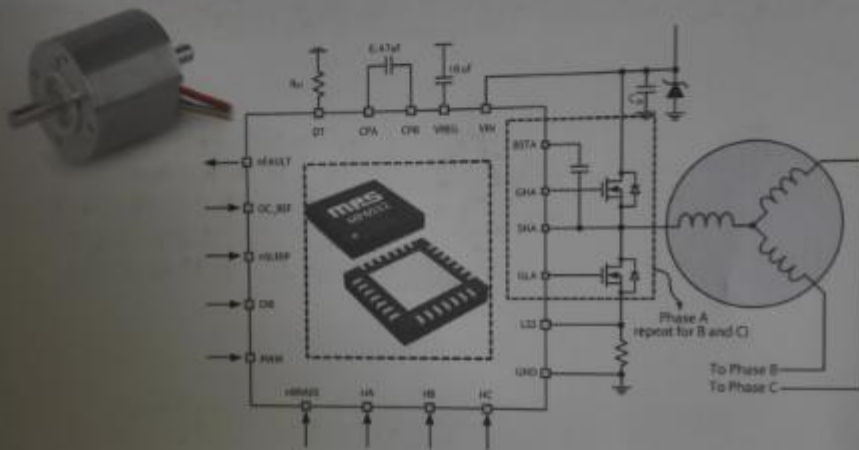
- High Resolution
- Fast Response
- Small Solutions Size
- Low Supply Current
- Side-Shaft Mounting Capability



Part Number	Description	Min Input (V)	Max Input (V)	Supply Current (mA)	Output Type	Resolution	Other Features	Status
MA100	Angular Sensor for 3-Phase Motor Commutation with Side-Shaft Positioning Capability	3	3.6	8.5	UVW	8	Side-Shaft Mounting	Released
MA120	Angular Sensor for 3-Phase BLDC Motor Commutation	3	3.6	8.5	UVW	8	-	Released
MA300	Angular Sensor for 3-Phase BLDC Motor Commutation and Position Control with Side-Shaft Positioning Capability	3	3.6	6.6	UVW ABZ	11.5	Side-Shaft Mounting	Released
MA700	Angular Sensor for Position Control with Side-Shaft Positioning Capability	3	3.6	6.6	ABZ	11.5	Side-Shaft Mounting	Released
MA750	Contactless Turning Knob Sensor	3	3.6	6.6	PWM	8	-	Released

# MP6532

## 5V至60V, 三相无刷直流电机前级驱动器



### MP6532主要特点:

- 宽输入电压范围: 5V到60V
- 接受霍尔换相信号输入, 简化设计
- 内置自举和电荷泵电路, 支持100%占空比工作
- 低功耗休眠模式适用于电池供电设备
- 外部MOSFET过流保护可灵活编程
- 接受PWM速度控制
- 电机启动电流限制

### MP6532应用范围:

- 3相无刷直流电机和永磁同步电机
- 手持电钻
- 冲击钻
- 电动自行车



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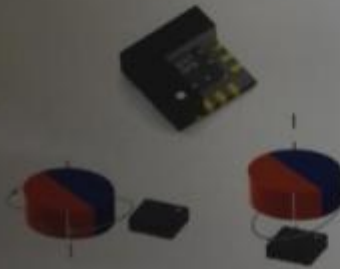
# MPS MagAlpha 磁角度传感器

## 无刷换相和转子位置检测的革命性解决方案



- 实时感应和传送转子位置
- 提供实时UVW换相信号
- 支持高达12万转/分钟的转速
- 传感器支持同轴或侧轴摆放
- 非常适用于紧凑的电机应用

## 高速、高精度磁角度位置传感器



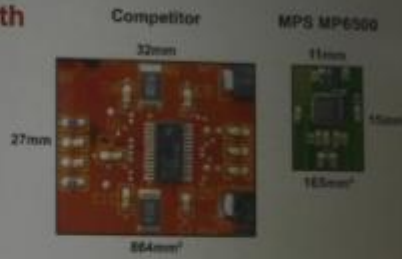
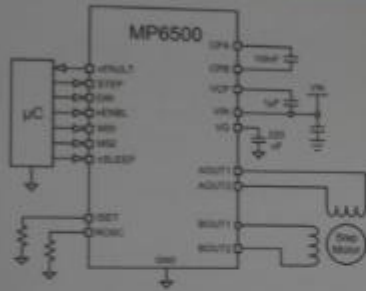
- 500kHz刷新速率，支持高达12万转/分钟的极高转速
- 可选串行输出分辨率：8位到16位
- 业界最低的3 $\mu$ s数据延迟
- 业界最小的角度传感器封装：0FN3x3x0.9mm<sup>3</sup>
- 灵活的同轴和轴侧摆放，适用于电机霍尔、光电编码器、旋转编码器替代

MPS

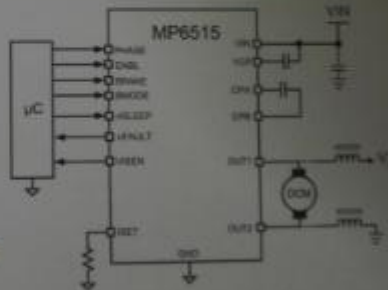
Simple, Easy Solutions

# Industry-Leading Motor Driver Solutions

## MP6500 Stepper Motor Driver with Integrated Current Sense



## MP6515 H-Bridge Driver with Internal Current Measurement



## MP6513 Full-Bridge Motor Driver

