Motor Driver Solutions

Stepper, Brushless DC, Brushed DC, Servo Motors, and Solenoids
The MPS Quality Assurance organization develops, coordinates, and champions strategic, quality initiatives throughout MPS Inc., its foundries, and sub-contractors. Its mission is to enable MPS to design, develop, manufacture, and deliver products to our customers with world-class quality and reliability that meet and exceed our customers’ expectations.

### MPS and Its Supplier Quality Systems and Certificates:
- ISO9001:2008 (MPS)
- EU RoHS/HF/REACH Compliant (MPS)
- Sony Green Partner (MPS & Suppliers)
- TS16949 (Suppliers)
- ISO14001 (Suppliers)

### Product Quality:
- Automotive Products Qualified per AEC-Q100 Standard
- Standard Products Qualified per JEDEC and Military Standard
- Reliability Failure Rate <10FIT
- Product Quality Level <1.0ppm

### Quality Control and Monitor:
- On-Site Foundry and Assembly Teams for Real-Time Actions
- Quarterly Supplier Quality Review and Annual Supplier Audit
- Short-Term Reliability Monitor Test – Daily
- Long-Term Reliability Monitor Test – Monthly
- Real-Time Engineering Actions on Monitor Failure
- Quarterly Reliability Monitor Reports
# Motor Driver Solutions

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MPS motor driver solutions offer a wide range of high-performance, cost-effective, and reliable solutions for stepper motors, brushless DC motors, brushed DC motors, and solenoids. Using 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. Thus, MPS has created superior motor driver solutions for multiple applications.
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

**MPS Advantages**

- Low On Resistance Significantly Improves Thermal Performance
- Smooth Torque and Accurate Stepping Control
- Extensive Protection Functions Increase System Reliability

### Motor Driver Solutions

**Table: Stepper Motor Drivers**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Min Input (V)</th>
<th>Max Input (V)</th>
<th>Max Current (A)</th>
<th>Step Mode</th>
<th>Control Interface</th>
<th>Description</th>
<th>Status</th>
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<tbody>
<tr>
<td>MP6506</td>
<td>2.7</td>
<td>15</td>
<td>0.5</td>
<td>Full, Half</td>
<td>Parallel</td>
<td>15V, 0.5A Bipolar Stepper Motor Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MP6507</td>
<td>2.7</td>
<td>15</td>
<td>0.7</td>
<td>Full, Half</td>
<td>Parallel</td>
<td>15V, 0.7A Bipolar Stepper Motor Driver</td>
<td>Released</td>
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<td>MP6508</td>
<td>2.7</td>
<td>18</td>
<td>1.2</td>
<td>Full, Half</td>
<td>Parallel</td>
<td>18V, 1.2A Bipolar Stepper Motor Driver</td>
<td>Released</td>
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<tr>
<td>MP6509</td>
<td>2.7</td>
<td>18</td>
<td>1.2</td>
<td>Full, Half</td>
<td>Parallel</td>
<td>18V, 1.2A Bipolar Stepper Motor Driver with Current Attenuation</td>
<td>Released</td>
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<tr>
<td>MP6520</td>
<td>8.5</td>
<td>35</td>
<td>1.2</td>
<td>Full, Half, Quarter, Eighth</td>
<td>Indexer</td>
<td>35V, 1.3A Bipolar Stepper Motor Driver with Micro-Stepping</td>
<td>Released</td>
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<td>MP6518</td>
<td>8.5</td>
<td>35</td>
<td>1.5</td>
<td>Full, Half, Quarter, Eighth</td>
<td>Indexer</td>
<td>35V, 1.5A Bipolar Stepper Motor Driver with Micro-Stepping</td>
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<td>MP6501A</td>
<td>8.5</td>
<td>35</td>
<td>2.5</td>
<td>Full, Half, Quarter, Eighth</td>
<td>Indexer</td>
<td>35V, 2.8A Bipolar Stepper Motor Driver with Micro-Stepping and Internal Current Sense</td>
<td>Released</td>
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<tr>
<td>MP6500</td>
<td>8.5</td>
<td>35</td>
<td>2.8</td>
<td>Full, Half, Quarter, Eighth</td>
<td>Indexer</td>
<td>35V, 2.8A Bipolar Stepper Motor Driver with Micro-Stepping and Internal Current Sense</td>
<td>Sampling</td>
</tr>
</tbody>
</table>
100% slow decay in constant current level brings small current ripple

30% fast decay & 70% slow decay shorten the current level transition time

↓

Automatic decay mode results in low torque ripple and fast response
MP6500 Stepper Motor Driver

Small Solution Size with Integrated Current Sensing

MP6500: 165mm²

Competitor: 864mm²

Better Current Control for Improved Motion Quality
A brushed DC motor is a mechanically commutated motor running from a DC power source. It is widely used in many 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 Advantages
- Low On Resistance Significantly Improves Thermal Performance
- Wide Input Range to Support Different Applications
- Extensive Protection Functions Increase System Reliability

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP6506</td>
<td>15V, 0.5A Dual Full Bridge Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MP6507</td>
<td>15V, 0.7A Dual Full Bridge Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MP6513</td>
<td>21V, 0.8A Full Bridge Driver</td>
<td>Released</td>
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<tr>
<td>MP6514</td>
<td>21V, 0.8A Full Bridge Driver</td>
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<tr>
<td>MPG6523</td>
<td>40V, 0.9A Triple Half-Bridge Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MPG6526</td>
<td>40V, 0.9A Hex Half-Bridge Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MP6508</td>
<td>18V, 1.2A Dual Full-Bridge Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MP6509</td>
<td>18V, 1.2A Dual Full-Bridge Driver with Current Attenuation</td>
<td>Released</td>
</tr>
<tr>
<td>MP6515</td>
<td>35V, 2.8A Full Bridge Driver with Internal Current Sense</td>
<td>Released</td>
</tr>
<tr>
<td>MP6516</td>
<td>35V, 2.8A Full Bridge Driver with Internal Current Sense</td>
<td>Released</td>
</tr>
<tr>
<td>MP8046</td>
<td>28V, 5A Full Bridge Driver</td>
<td>Released</td>
</tr>
<tr>
<td>MP8049S</td>
<td>26V, 5.5A Dual Full Bridge Driver</td>
<td>Released</td>
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<tr>
<td>MPG6610</td>
<td>60V, 3A Half-Bridge Driver</td>
<td>Sampling</td>
</tr>
</tbody>
</table>
MPQ6610 Half-Bridge Driver

60V, Versatile 3A Driver – High-Side, Low-Side, or Half-Bridge, with Current Measurement and Full Protection Features

![Schematic diagram of MPQ6610]

- Simple interface
- Full fault detection
- Bidirectional analog current measurement
- Resistor sets current limit
- Drives a DC motor, solenoid, relay coil etc...
- Drives load to ground, supply, or another MPQ6610

Low RDS(ON) Enables Smallest Footprint

**MPQ6610**

- 9mm² (TSOT23)

**Competition**

- 30mm² (SOIC) 100mΩ
- 150mm² 160mΩ
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 systems. 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, 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
MPS Advantages

- Low On Resistance Significantly Improves Thermal Performance
- Wide Input Range to Support Different Applications
- Extensive Protection Functions Increase System Reliability

![Brushless DC Motor Pre-Drivers Diagram](image)

### Part Number Description

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Min Supply (V)</th>
<th>Max Supply (V)</th>
<th>Max SW Voltage (V)</th>
<th>Number of Half-Bridges</th>
<th>Sink/Source Current (A)</th>
<th>Hall Input</th>
<th>Description</th>
<th>Status</th>
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<td>MP6530</td>
<td>5</td>
<td>60</td>
<td>60</td>
<td>3</td>
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<td>60</td>
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<td>MP6534</td>
<td>5</td>
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<td>MP1921A</td>
<td>9</td>
<td>18</td>
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<td>8</td>
<td>100</td>
<td>120</td>
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<td>100V 3-Phase BLDC Motor Pre-Driver</td>
<td>Sampling</td>
</tr>
</tbody>
</table>
MP6539 BLDC Pre-Driver

100V Three-Phase BLDC Pre-Driver Family

Has Current Measurement and Built-In Protection Features

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 (HS+LS)
- 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 FCTSOT23-6-SL Package

Applications

- 3-Phase Brushless DC Motors and Permanent Magnet Synchronous Motors
- Power Drills
- E-Bikes
MOTOR DRIVERS

Fan Drivers and Integrated BLDC Motor Drivers

MPS Advantages

- 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
- Integrated Hall Sensor

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Min Input (V)</th>
<th>Max Input (V)</th>
<th>Number of Half-Bridges</th>
<th>Output Current (A)</th>
<th>Hall Input</th>
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<td>MP9518</td>
<td>3</td>
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<td>18V, 0.6A Single Phase BLDC Motor Driver with Hall Sensor, Speed Indicator, Locked Rotor Protection</td>
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<tr>
<td>MP6536</td>
<td>5</td>
<td>26</td>
<td>3</td>
<td>5.5</td>
<td>No</td>
<td>26V, 5A 3-Phase Power Stage</td>
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Motor Driver Solutions
2016
MP6517 Single-Phase Fan Driver

Industry’s First BLDC Fan Driver with Integrated Hall Sensor in a Tiny TSOT23 Package

- 3V to 18V Input Range
- Input Reverse Protection
- Soft On/Off Switching Phase
- Auto. BEMF and Current PLL
- On-Chip Hall Sensor (min. 3mT)
- 12~48kHz PWM Input
- Only 2 Components Needed Compared to 7 or 8
- Simple PCB Design

Straight Lead TSOT23-6
Complete Motor Driver Solutions

**MOTOR DRIVERS**

**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

![MP6500 Solution Kit](image1)

**MP6501A Solution Kit (EVKT6501A) $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

![MP6501A Solution Kit](image2)

**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

![MP6530 Solution Kit](image3)
**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
About Monolithic Power Systems

Who we are:

We are creative thinkers. We break boundaries. We take technology to new levels. As a leading international semiconductor company, Monolithic Power Systems (MPS) creates cutting-edge solutions to improve the quality of life with green, easy-to-use products.

What we do:

We make power design fun! With our innovative proprietary technology processes, we thrive on re-imagining and re-defining the possibilities of high-performance power solutions in industrial applications, telecom infrastructures, cloud computing, automotive, and consumer applications.

Where we come from:

It started with a vision. Michael Hsing, pioneering engineer and CEO, founded Monolithic Power Systems, Inc. in 1997 with the belief that an entire power system could be integrated onto a single chip. Under his leadership, MPS has succeeded not only in developing a monolithic power module that truly integrates an entire power system in a single package, but also it continues to defy industry expectations with its patented groundbreaking technologies.

Our values:

We cultivate creativity
As a company we believe in creating an environment that encourages and challenges our employees to collaborate and think outside the box to excel beyond their preconceived capabilities.

We do not accept the status quo
We do not believe in limitations. It is not about what is, but what can be. Possibilities are endless at MPS.

We are passionate about sustainability
It’s about the future. From materials to finances, we are committed to conservation. We will not tolerate waste in an effort to improve and preserve the quality of life.

We are committed to providing innovative products to our customers.
Let us do the heavy lifting. We relentlessly strive to make system design versatile and effortless to meet our customers’ specific needs. We’ll do the work, so our customers can have the fun.
Need products, design tools, or support?

For a complete list of sales offices and distributors, please visit MonolithicPower.com/Sample-Buy
For general support, please visit MonolithicPower.com/Contact-Us
For tools, evaluation boards, and design support, please visit MonolithicPower.com/Design-Support

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Motor Driver Solutions

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