



Motor Driver ICs

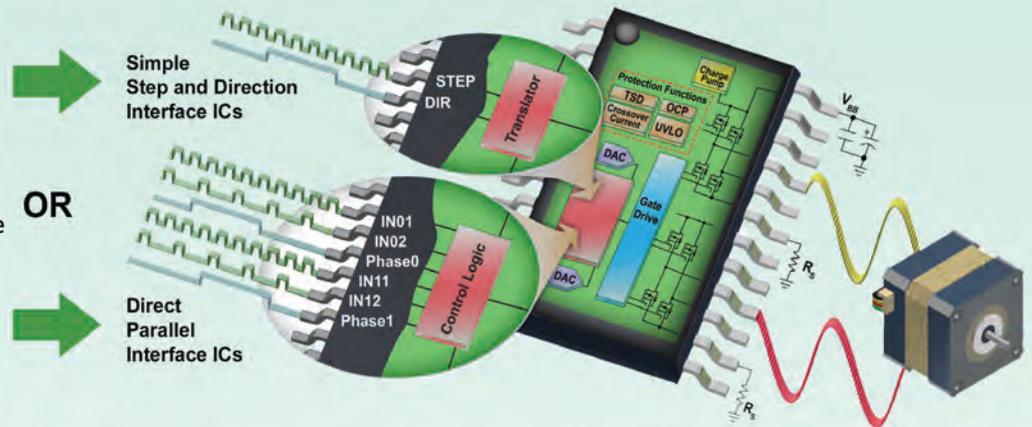
Brushless DC, Brush DC, and Stepper Motors
Industrial, Consumer and Computer (IC&C) Applications



Bipolar Stepper Motor Drivers

Allegro MicroSystems offers a full line of stepper motor driver and pre-driver ICs. These devices feature easy to use two wire step and direction translator interfaces as well as industry standard parallel or serial control. Microstepping positioning is available with resolutions from full step to 16

microsteps per step. Microstepping results in increased step accuracy and less resonance issues which results in lower audible noise. Safety features include thermal shutdown, undervoltage lockout and over current protection. Allegro offers a complete lineup of stepper motor drivers for industrial, consumer, and computer applications.



Available Features:

- Parallel, Serial and Step/Direction interfaces
- Microstepping
- Stall detect assistance
- Diagnostic outputs
- Protection features – Under-voltage lockout, thermal shutdown, shoot through, overvoltage, over current protection
- Internal DMOS outputs or gate controllers to drive external MOSFETs
- Fixed off-time PWM current control
- Slow, Fast and Mixed current decay mode control
- Synchronous rectification
- Package options include QFN and TSSOP packages with exposed thermal pads and lead (Pb) free

Key Applications:

Industrial, Consumer & Computer Applications

- Laser / dot matrix /inkjet / POS / Label / 3-D printers
- CCTV camera scan, tilt, focus control
- Copiers
- Scanners
- Manufacturing industries – textile, robotic placement
- Bipolar stepper motor applications which require advanced diagnostics, and operation over extended temperature and voltage ranges.
- Imaging systems – microscopes, industrial imaging

Key Devices:

- A4979:** Microstepping Programmable Stepper Motor Driver with Stall Detect and Short Circuit Protection
- A4982 and A4984:** DMOS Microstepping Driver with Translator and Overcurrent Protection
- A4989:** Dual Full-Bridge MOSFET Driver with Microstepping Translator
- A3977 and A3979:** Microstepping DMOS Driver with Translator

Step/Direction Interface

| Part Number | Output Voltage Range (V) | Output Current Range | Interface | Packages |
|-------------|--------------------------|----------------------|--|---------------------------|
| A4989 | 12 to 50 | <10 A Typical | Parallel (Translator) (MOSFET gate driver IC) | TSSOP-38 |
| A3987 | 8 to 50 | 1.5 A | Parallel (Translator) | eTSSOP-24 |
| A4979 | 7 to 50 | 1.5 A | SPI / Parallel (Translator) | eTSSOP-28 |
| A4980* | 3.3 to 50 | 1.4 A | Parallel / SPI (Translator) | eTSSOP-28 |
| A4992* | 7 to 50 | 1.4 A | Parallel / SPI (Translator) | eTSSOP-20 |
| A3977 | 8 to 35 | 2.5 A | Parallel (Translator) | eTSSOP-28 |
| A3979 | 8 to 35 | 2.5 A | Parallel (Translator) | eTSSOP-28 |
| A4982 | 8 to 35 | 2.0 A | Parallel (Translator) | QFN-32, eTSSOP-24 |
| A4983 | 8 to 35 | 2.0 A | Parallel (Translator) | QFN-28 |
| A4984 | 8 to 35 | 2.0 A | Parallel (Translator) | QFN-24, QFN-32, eTSSOP-24 |
| A4985 | 8 to 35 | 1.0 A | Parallel (Translator) | QFN-24, QFN-32, eTSSOP-24 |
| A4988 | 8 to 35 | 2.0 A | Parallel (Translator) | QFN-28 |
| A3967 | 4.75 to 30 | 750 mA | Parallel (Translator) | SOIC-24 |

Note: * High temperature options available

Parallel Interface

| Part Number | Output Voltage Range (V) | Output Current Range | Interface | Packages |
|-------------|--------------------------|--------------------------|--------------------------------|--------------------------|
| A4975 | 5 to 50 | 1.5 A | Parallel (Phase, Do, D1, D2) | DIP-16, SOIC-16 |
| A4970 | 10 to 45 | 750 mA | Parallel (Phase, Io, I1) | DIP-34, SOIC-24, PLCC-44 |
| A4990* | 7 to 50 | 1.4 A | Parallel (Phase, IN1, IN4) | eTSSOP-20 |
| A3988 | 8 to 36 | 1.2 A | Parallel (Phase, Io, I1) | QFN-36, eLQFP-48 |
| A3989 | 8 to 35 | 1.2 A (Step), 2.4 A (DC) | Parallel (Phase, Io, I1) | QFN-36 |
| A3995 | 8 to 35 | 2.4 A | Parallel (Phase, Enable, Mode) | QFN-36 |
| A4986 | 8 to 35 | 2 A | Parallel (Phase, Io, I1) | eTSSOP-24 |
| A4987 | 8 to 35 | 1 A | Parallel (Phase, Io, I1) | QFN-24, eTSSOP-24 |
| A3966 | 4.5 to 30 | 650 mA | Parallel (Phase, Enable) | SOIC-16 |
| A3906 | 2.5 to 9 | 1 A | Parallel (Phase, IN1, IN4) | QFN-20 |
| A3901 | 2.5 to 5.5 | 400 mA | Parallel (Phase, IN1, IN4) | DFN-10 |

Note: * High temperature options available

Serial Interface

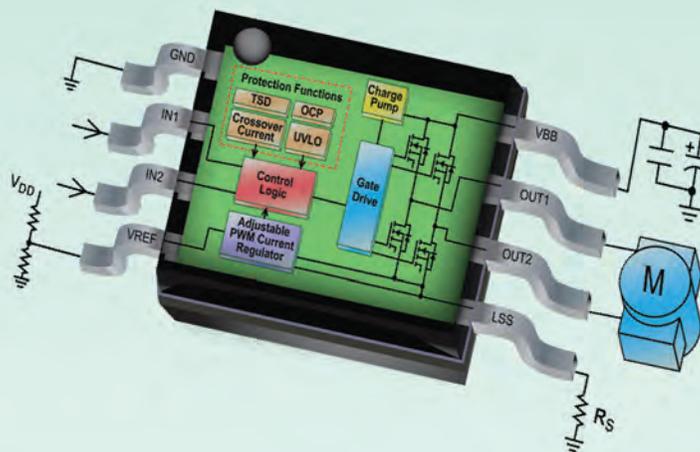
| Part Number | Output Voltage Range (V) | Output Current Range | Interface | Packages |
|-------------|--------------------------|--|-----------------------------|-------------------|
| A3992 | 15 to 50 | 1.5 A | Serial | DIP-24, eTSSOP-24 |
| A3985 | 12 to 50 | <10 A Typical (MOSFET gate driver IC) | Serial | TSSOP-38 |
| A3998 | 9 to 50 | 1.5 A | Serial | QFN-32 |
| A4979 | 7 to 50 | 1.5 A | SPI / Parallel (Translator) | eTSSOP-28 |
| A4980* | 3.3 to 50 | 1.4 A | SPI / Parallel (Translator) | eTSSOP-28 |

Note: * High temperature options available

Brush DC Motor Drivers

Brush DC motors are the most widely used drivers due to their low cost and simple drive control options.

Typical brush DC motor drivers consist of a half bridge for a single direction operation and an H-bridge configuration for bidirectional control. PWM (Pulse Width Modulation) control can be used to regulate motor speed, torque, or position.



Key Applications:

Industrial, Consumer & Computer Applications

- Inkjet/laser/POS/ Label printers
- Copiers
- Robotic vacuums
- Vending and ticketing machines
- Gaming electronics
- Scanners
- Office equipment peripherals

Available Features:

- Low standby current for energy efficiency
- Internal DMOS outputs or gate controllers to drive external MOSFETs
- Parallel interfaces with forward, reverse, coast, and brake modes
- Commercial grade and fully automotive qualified drivers
- Small footprint and reduced external components
- Strong protection and diagnostic features

Key Devices:

- A4950 and A4952/53: Full-Bridge DMOS PWM Motor Driver
- A3959: DMOS Full-Bridge PWM Motor Driver
- A4957: Full Bridge MOSFET Driver
- A4954: Dual Full-Bridge DMOS PWM Motor Driver

Low-Voltage Motor Drivers (Integrated MOSFET ICs)

| Part Number | Output Voltage Range (V) | Output Current Range | Number of Bridges | Logic Supply Voltage Range | Packages |
|-------------|--------------------------|----------------------|-------------------|----------------------------|------------------|
| A3909 | 4 to 18 | 1 A | Dual Full | Internally generated | SSOP-10, MSOP-10 |
| A3906 | 2.5 to 9 | 1 A | Dual full | Internally generated | QFN-20 |
| A3918 | 2.5 to 9 | 1 A | Single full | Internally generated | QFN-16 |
| A3901 | 2.5 to 5.5 | 400 mA | Dual full | Internally generated | DFN-10 |
| A3903 | 2.5 to 5.5 | 500 mA | Single full | Internally generated | DFN-8 |
| A3908 | 2.5 to 5.5 | 500 mA | Single full | Internally generated | DFN-8 |
| A3910 | 2.5 to 5.5 | 500 mA | Dual Half | Internally generated | DFN-8 |

MOSFET Gate Driver ICs

| Part Number | Output Voltage Range (V) | Output Current Range | Number of Bridges | Logic Supply Voltage Range | Packages |
|-------------|--------------------------|----------------------|-------------------|----------------------------|--------------------|
| A3946* | 7 to 60 | >10 A Typical | Half bridge | Internally generated | SOIC-16, eTSSOP-16 |
| A3921* | 7 to 50 | > 10 A Typical | Single full | Internally generated | eTSSOP-28 |
| A4940* | 5.5 to 50 | >10 A Typical | Single full | 3 V to 5.5 V | eTSSOP-24 |
| A4957 | 4.5 to 50 | >10 A Typical | Single full | 3 V to 5.5 V | QFN-16 |

Note: * High temperature options available

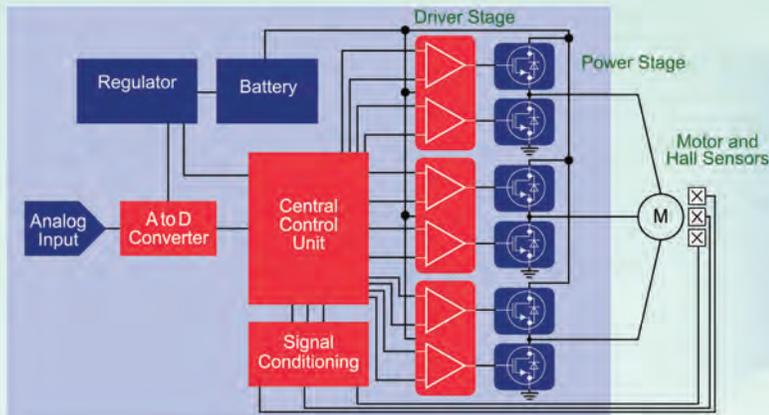
Integrated MOSFET ICs

| Part Number | Output Voltage Range (V) | Output Current Range | Number of Bridges | Logic Supply Voltage Range | Packages |
|----------------|--------------------------|----------------------|--------------------------------|----------------------------|----------------------------|
| A3959 | 9.5 to 50 | 3 A | Single full | 4.5 V to 5.5 V | DIP-24, SOIC-24, eTSSOP-28 |
| A3998 | 9 to 50 | 1.5 A | Dual full with dual regulators | 3 V to 5.5 V | QFN-32 |
| A4973 | 5 to 50 | 1.5 A | Single full | 3 V to 5.5 V | DIP-16, SOIC-16 |
| A4950 / A4950* | 8 to 40 | 3.5 A | Single full | Internally generated | SOICN-8 |
| A4952 | 8 to 40 | 2 A | Single full | Internally generated | MSOP-10 |
| A4953 | 8 to 40 | 2 A | Single full | Internally generated | SOICN-8 |
| A4954 | 8 to 40 | 2 A | Dual full | Internally generated | eTSSOP-16 |
| A3950 | 8 to 36 | 2.8 A | Single full | Internally generated | eTSSOP-16, QFN-16 |
| A3968 | Vcc to 30 | 650 mA | Dual full | 4.75 V to 5.5 V | SOIC-16 |

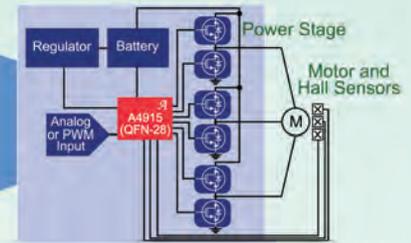
Note: * High temperature options available

Brushless DC Motor Drivers

Allegro MicroSystems plays a key role in enabling brushless DC motor adoption by simplifying the complexities of electronic commutation. Allegro offers a range of products targeted at BLDC applications which span the industrial, consumer and computer markets (IC&C).



Existing Solution



Allegro Solution

Allegro up-integrates as many as six individual SOICs onto a single chip solution.



Available Features:

- Self commutating six-step / trapezoidal state machine with Hall sensor inputs
- Sensorless and sinusoidal commutation
- Back EMF sensing capability
- Automotive grade ICs with diagnostics and robust protection features
- Integrated VCM, drivers
- 3 phase and single phase fan drivers

Key Applications:

Industrial, Consumer & Computer Applications

- Power tools: drills, table saws, grinders
- Household: shop vacuums
- Lawn and garden equipment: lawn mowers, leaf blowers
- Pumps: automated coffee machines
- Fans and blowers

Key Devices:

- A4915: 3-Phase MOSFET Driver
- A4960: Sensorless BLDC Controller
- A4931: 3-Phase DC Motor Predriver
- A5940: Three Phase Sensorless Fan Driver
- A5943: Three Phase Sinusoidal Fan Driver

MOSFET Gate Driver ICs

| Part Number | Output Voltage Range (V) | Output Current | Number of Bridges | Key Spec | Interface | Packages |
|-------------|--------------------------|----------------|--------------------|---|------------------|-------------------------------|
| A4900 | 600 | >10 A Typical | Three half bridges | Vds Monitors, Diagnostics | Parallel | QSOP-44 |
| A4937 | 5.5 to 50 | >10 A Typical | Three half bridges | Serial interface, Extensive serial diagnostic, Sleep mode | Serial | eTSSOP-28 |
| A3946* | 7 to 60 | >10 A Typical | Half bridge | Diagnostics, High current gate drive, Top off charge pump | Parallel | eTSSOP-16 |
| A3932 | 12 to 50 | <25 A Typical | Three half bridges | Hall commutation logic, PWM current control, Tach output | Parallel | TSSOP-38 |
| A3938 | 12 to 50 | <25 A Typical | Three half bridges | A3932 w/ selectable coast or brake on power-down | Parallel | TSSOP-38 |
| A3930/31* | 7 to 50 | >10 A Typical | Three half bridges | Hall commutation logic, PWM current control, diagnostics | Parallel | eLQFP-48 |
| A4933* | 7 to 50 | >10 A Typical | Three half bridges | Diagnostics and sense amplifier, Pin | Parallel | eLQFP-48 |
| A4935* | 7 to 50 | >10 A Typical | Three half bridges | Diagnostics and sense amplifier Top off charge pump | Parallel | eLQFP-48 |
| A4960* | 7 to 50 | >10 A Typical | Three half bridges | Sensorless commutation, Programmable startup and run parameters and diagnostics | Parallel and SPI | eLQFP-32 |
| A4910* | 5.5 to 50 | >10 A Typical | Three half bridges | Programmable parameters Diagnostics, 3 x Sense amplifiers | Parallel and SPI | eLQFP-48 |
| A4915 | 5 to 50 | >10 A Typical | Three half bridges | Hall commutation logic, Analog speed input, Center aligned PWM | Parallel | eTSSOP-28, 5 x 5 mm QFN-28 |
| A4931 | 8 to 38 | <10 A Typical | Three half bridges | Hall commutation logic , PWM current control, Lock detect, FG output | Parallel | 5 x 5 mm QFN-28 |
| A4923* | 10 to 32 | <10 A Typical | Three half bridges | Hall commutation logic , Single wire start-up, Brake and Direction inputs and FG output | Parallel | 5 x 5 mm QFN-32 |
| A4930 | 8 to 36 | <10 A Typical | Single full bridge | Single phase Hall commutation logic, PWM current control, Soft-start | Parallel | 5 x 5 mm QFN-28 |

Note: * High temperature options available

Integrated MOSFET ICs

| Part Number | Output Voltage Range (V) | Output Current | Key Spec | Interface | Packages |
|-------------|--------------------------|----------------|--|------------------------------|---------------------------------------|
| A4941* | 4.5 to 20 | 1.25 A | 3-phase sensorless trapezoidal commutation, OCP, soft switching | PWM, FG | eTSSOP-16 |
| A4942 | 5 to 16 | 1.45 A | 3-phase sensorless trapezoidal commutation, closed loop speed control, OCP, soft switching, phase advance, soft start | PWM duty, FG | 4 x 4 mm QFN-20 |
| A4944 | 4 to 17 | 1 A | 3-phase sinusoidal drive, OCP, soft start, phase advance, HALL power supply | PWM duty, Analog voltage, FG | eTSSOP-16 |
| A4945* | 4 to 18 | 1.6 A | 3-phase sensorless sinusoidal drive, auto phase advance, OCP, soft start | PWM duty, FG | SPICN-8, eSOICN-8 |
| A4946* | 4.8 to 28 | 1.63 A | 3-phase sinusoidal drive, OCP, OCL, soft start, Phase advance, HALL power supply, AEC-Q100 qualified | PWM duty, Analog voltage, FG | eTSSOP-16 |
| A4947 | 4 to 17 | 1 A | 3-phase sinusoidal drive, OCP, soft start, Phase advance, HALL power supply | PWM duty, Analog voltage, FG | eTSSOP-16 |
| A4949* | 4 to 18 | 1.6 A | 3-phase sensorless sinusoidal drive, auto phase advance, OCP, soft start | Analog voltage, FG | SPICN-8, eSOICN-8 |
| A5940 | 4 to 18 | 2.1 A | 3-phase sensorless sinusoidal drive, quiet startup adjustment, high efficiency algorithm, OCP, OCL, adjustable minimum speed | PWM duty, FG | SOIC-10, eSOIC-10, 3 x 3 mm DFN-10 |
| A5943 | 4.8 to 28 | 2.1 A | 3-phase sinusoidal drive, OCP, OCL, soft start, phase advance, HALL power supply | PWM duty, Analog voltage, FG | eTSSOP-16 |
| A5944 | 3 to 6 | 720 mA | 3-phase sensorless sinusoidal drive, quiet startup adjustment, high efficiency algorithm, OCP, OCL, low standby mode current | PWM duty, FG | 3 x 3 x 0.55 mm DFN-10 |
| A3907 | 2.3 to 5.5 | 102 mA | VCM driver with 1-bit DtA converter, Current ramp control | I ² C | WLCSP 1.47 x 0.97 mm |

Note: * High temperature options available



Allegro offers an industry leading portfolio of motor driver and controller ICs for brushless DC, brush DC, and stepper motors. Product architectures vary from highly-efficient internal DMOS drivers to MOSFET controller ICs suited for a wide variety of motor applications. Coupled with a strong system level expertise, Allegro's motor driver IC portfolio provides the user with a high-performance, leading edge and reliable motor control solution.

Allegro's BCD (bipolar, CMOS and DMOS components) technology allows for a wide range of features that is well suited for today's demanding motor control applications. Allegro motor driver ICs can be found in a number of demanding markets, including automotive, industrial and office equipment. Its products are found in motor driver applications such as automotive pumps and blowers, electronic power steering (EPS) systems, printers (ink-jet and laser) and a variety of cooling fan applications.



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