

**Description**

The AZBH12A8 PWM servo drive is designed to drive brushless DC motors at a high switching frequency. To increase system reliability and to reduce cabling costs, the drive is designed for direct integration into your PCB. The AZBH12A8 is fully protected against over-voltage, under-voltage, over-current, over-heating, invalid commutation, and short-circuits. A single digital output indicates operating status. The drive interfaces with digital controllers that have analog  $\pm 10V$  output. The AZBH12A8 can utilize Hall Sensor feedback for velocity control. This servo drive requires only a single unregulated isolated DC power supply, and is fully RoHS (Reduction of Hazardous Substances) compliant.

**Power Range**

|                    |             |
|--------------------|-------------|
| Peak Current       | 12 A        |
| Continuous Current | 6 A         |
| Supply Voltage     | 20 - 80 VDC |


**Features**

- ▲ Four Quadrant Regenerative Operation
- ▲ Direct Board-to-Board Integration
- ▲ Lightweight
- ▲ High Switching Frequency
- ▲ High Performance Thermal Dissipation
- ▲ Differential Input Command
- ▲ Digital Fault Output Monitor
- ▲ Hall Velocity Mode
- ▲ Current Monitor Output
- ▲ Compact Size
- ▲ High Power Density
- ▲ Velocity Monitor Outputs

**HARDWARE PROTECTION**

- Over-Voltage
- Under-Voltage
- Over-Current
- Over-Temperature
- Short-circuit (phase-phase)
- Short-circuit (phase-ground)

**INPUTS/OUTPUTS**

- Digital Fault Output
- Digital Inhibit Input
- Analog Current Monitor
- Analog Command Input
- Analog Current Reference

**COMMUTATION**

- Trapezoidal

**FEEDBACK SUPPORTED**

- Hall Sensors
- Tachometer ( $\pm 60$  VDC)

**MODES OF OPERATION**

- Current
- Open Loop
- Hall Velocity
- Tachometer Velocity

**MOTORS SUPPORTED**

- Three Phase (Brushless)
- Single Phase (Brushed, Voice Coil, Inductive Load)

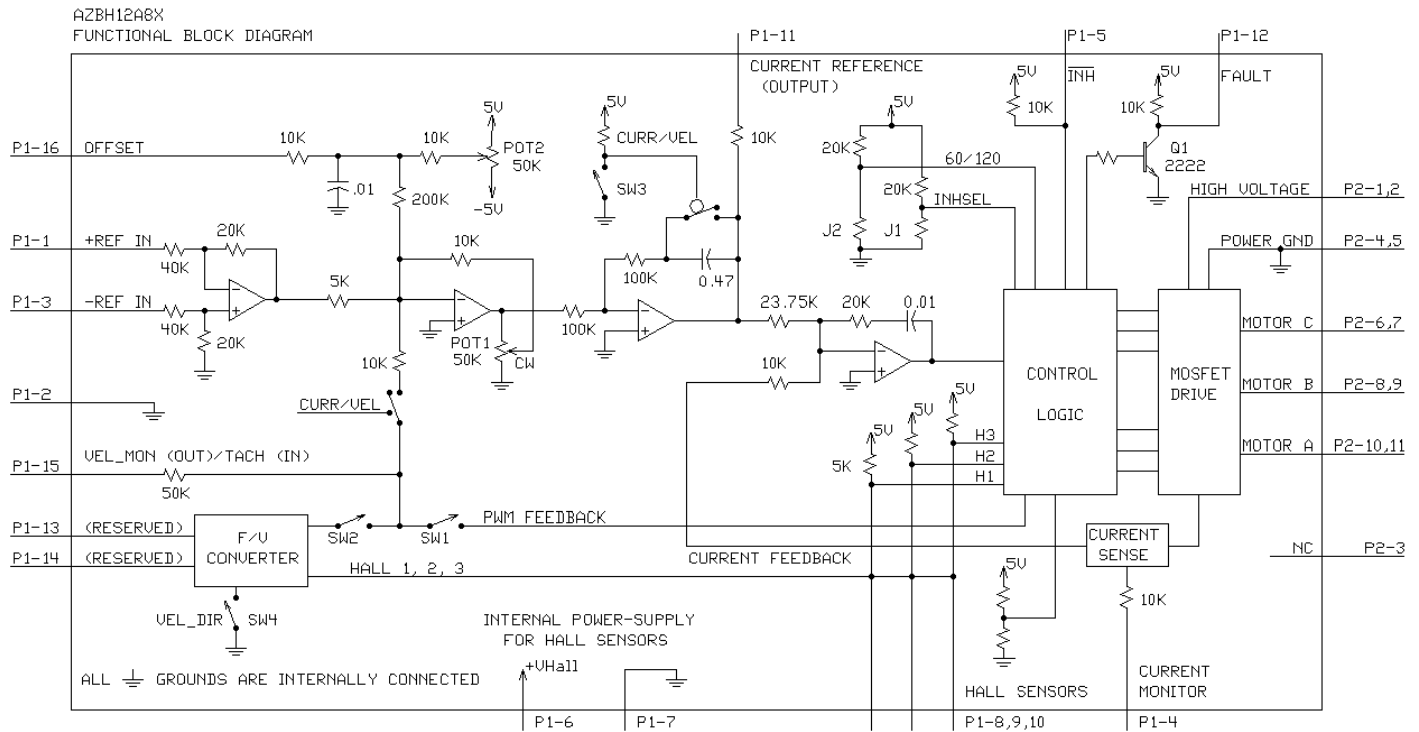
**COMMAND SOURCE**

- $\pm 10$  V Analog

**COMPLIANCES & AGENCY APPROVALS**

- CE Class A (LVD)
- CE Class A (EMC)
- RoHS

**BLOCK DIAGRAM**



**Information on Approvals and Compliances**



Compliant with European CE for both the Class A EMC Directive 89/336/EEC on Electromagnetic Compatibility (specifically EN 61000-6-4:2001, EN 61000-6-2:2001, EN 61000-3-2:2000, and EN 61000-3-3:1995/A1:2001) and LVD requirements of directive 73/23/EEC (specifically EN 60204-1), a low voltage directive to protect users from electrical shock.



RoHS (Reduction of Hazardous Substances) is intended to prevent hazardous substances such as lead from being manufactured in electrical and electronic equipment.

**SPECIFICATIONS**

| Power Specifications                                |         |   |
|---|---------|---|
| Description   | Units   | Value   |
| DC Supply Voltage Range                             | VDC     | 20 - 80   |
| DC Bus Over Voltage Limit                           | VDC     | 88  |
| DC Bus Under Voltage Limit                          | VDC     | 18  |
| Maximum Peak Output Current <sup>1</sup>            | A       | 12  |
| Maximum Continuous Output Current                   | A       | 6   |
| Maximum Power Dissipation at Continuous Current     | W       | 24  |
| Minimum Load Inductance (Line-To-Line) <sup>2</sup> | µH      | 100   |
| Switching Frequency                                 | kHz     | 31  |
| Control Specifications                              |         |   |
| Description   | Units   | Value   |
| Command Sources                                     | -       | ±10 V Analog  |
| Feedback Supported                                  | -       | Halls, Tachometer (± 60 VDC)  |
| Commutation Methods                                 | -       | Trapezoidal   |
| Modes of Operation                                  | -       | Current, Hall Velocity, Open Loop, Tachometer Velocity  |
| Motors Supported                                    | -       | Three Phase (Brushless), Single Phase (Brushed, Voice Coil, Inductive Load)   |
| Hardware Protection                                 | -       | Invalid Commutation Feedback, Over Current, Over Temperature, Over Voltage, Under Voltage, Short Circuit (Phase-Phase & Phase-Ground) |
| Mechanical Specifications                           |         |   |
| Description   | Units   | Value   |
| Agency Approvals                                    | -       | CE Class A (LVD), CE Class A (EMC), RoHS  |
| Size (H x W x D)                                    | mm (in) | 63.5 x 50.8 x 16.8 (2.5 x 2 x 0.7)  |
| Weight  | g (oz)  | 86.0 (3.0)  |
| Heatsink (Base) Temperature Range <sup>3</sup>      | °C (°F) | 0 - 75 (32 - 167)   |
| Storage Temperature Range                           | °C (°F) | -40 - 85 (-40 - 185)  |
| Form Factor   | -       | PCB Mounted   |
| P1 Connector  | -       | 16-pin, 2.54 mm spaced header   |
| P2 Connector  | -       | 11-pin, 2.54 mm spaced header   |

**Notes**

1. Maximum duration of peak current is ~2 seconds.
2. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
3. Additional cooling and/or heatsink may be required to achieve rated performance.

**PIN FUNCTIONS**

| P1 - Signal Connector |                           |  |     |
|-----------------------|---------------------------|--|-----|
| Pin                   | Name                      | Description / Notes  | I/O |
| 1                     | +REF IN                   | Differential Reference Input ( $\pm 10$ V Operating Range, $\pm 15$ V Maximum Input)   | I   |
| 2                     | SIGNAL GND                | Signal Ground  | GND |
| 3                     | -REF IN                   | Differential Reference Input ( $\pm 10$ V Operating Range, $\pm 15$ V Maximum Input)   | I   |
| 4                     | CURRENT MONITOR           | Current Monitor. Analog output signal proportional to the actual current output. Scaling is 4 A/V. Measure relative to signal ground.  | O   |
| 5                     | INHIBIT IN                | TTL level (+5 V) inhibit/enable input. Leave open to enable drive. Pull to ground to inhibit drive. Inhibit turns off all power devices.   | I   |
| 6                     | +V HALL OUT               | Low Power Supply For Hall Sensors (+6 V @ 30 mA). Referenced to signal ground. Short circuit protected.  | O   |
| 7                     | SIGNAL GND                | Signal Ground  | GND |
| 8                     | HALL 1                    | Single-ended Hall/Commutation Sensor Inputs (+5 V logic level)   | I   |
| 9                     | HALL 2                    |  | I   |
| 10                    | HALL 3                    |  | I   |
| 11                    | CURRENT REFERENCE         | Measures the command signal to the internal current-loop. This pin has a maximum output of $\pm 7.32$ V when the drive outputs maximum peak current. Measure relative to signal ground.  | O   |
| 12                    | FAULT OUT                 | TTL level (+5 V) output becomes high when power devices are disabled due to at least one of the following conditions: inhibit, invalid Hall state, output short circuit, over voltage, over temperature, power-up reset.                                   | O   |
| 13                    | NC                        | Not Connected (Reserved)   | -   |
| 14                    | NC                        |  | -   |
| 15                    | VEL MONITOR OUT / TACH IN | Velocity Monitor. Analog output proportional to motor speed. In Hall Velocity mode, output is proportional to the electrical cycle frequency. Hall Velocity scaling is 100 Hz/V. For Tachometer Velocity mode, feedback voltage range is $\pm 60$ VDC max. | O/I |
| 16                    | OFFSET                    | Connection to external resistance for command offset adjustments. Apply a $\pm$ VDC (10V Max) signal through an external potentiometer into this pin to offset the input gain.   | I   |

| P2 - Power Connector |              |  |     |
|----------------------|--------------|--|-----|
| Pin                  | Name         | Description / Notes  | I/O |
| 1                    | HIGH VOLTAGE | DC Power Input. 3A Continuous Current Rating Per Pin.                          | I   |
| 2                    | HIGH VOLTAGE |  | I   |
| 3                    | NC (KEY)     | Key: No Connection (pin removed)   | -   |
| 4                    | PWR GND      | Power Ground (Common With Signal Ground). 3A Continuous Current Rating Per Pin | GND |
| 5                    | PWR GND      |  | GND |
| 6                    | MOTOR C      | Motor Phase C. 3A Continuous Current Rating Per Pin.                           | O   |
| 7                    | MOTOR C      |  | O   |
| 8                    | MOTOR B      | Motor Phase B. 3A Continuous Current Rating Per Pin.                           | O   |
| 9                    | MOTOR B      |  | O   |
| 10                   | MOTOR A      | Motor Phase A. 3A Continuous Current Rating Per Pin.                           | O   |
| 11                   | MOTOR A      |  | O   |

## HARDWARE SETTINGS

### Switch Functions

| Switch | Description  | Setting        |             |
|--------|--|----------------|-------------|
|        |  | On             | Off         |
| 1      | Open-loop mode selector. Activates internal PWM feedback.  | Open-loop mode | Other modes |
| 2      | Activate velocity feedback or monitor. For Hall Velocity mode, activates feedback. For Current mode, activates velocity monitor.   | Active         | Inactive    |
| 3      | Current mode selector.   | Current mode   | Other modes |
| 4      | Velocity feedback polarity. Changes the polarity of the internal feedback signal and the velocity monitor output signal. Inversion of the feedback polarity may be required to prevent a motor run-away condition. | Standard       | Inverted    |

### Mode Selection Table

|                     | SW1 | SW2 | SW3 |
|---------------------|-----|-----|-----|
| CURRENT             | OFF | ON  | ON  |
| OPEN LOOP           | ON  | OFF | OFF |
| HALL VELOCITY*      | OFF | ON  | OFF |
| TACHOMETER VELOCITY | OFF | OFF | OFF |

\*NOTE: See details of switch 4 for further Hall Velocity configuration information.

### Jumper Settings

Jumpers are SMT, 0 ohm resistors located on the underside of the drive PCB. By default, the drive is configured with the jumpers installed. Typical drive operation will not require the jumpers to be removed. Please contact the factory before jumper removal.

| Jumper | Description  | Configuration |             |
|--------|--|---------------|-------------|
|        |  | Not Installed | Installed   |
|        | SMT Jumper (0Ω Resistor)   |               |             |
| J1     | Inhibit logic. Sets the logic level of inhibit pins. Labeled J1 on the PCB of the drive.               | Low Enable    | Low Inhibit |
| J2     | Hall sensor phasing. Selects 120 or 60 degree commutation phasing. Labeled J2 on the PCB of the drive. | 60 degree     | 120 degree  |

### Potentiometer Functions

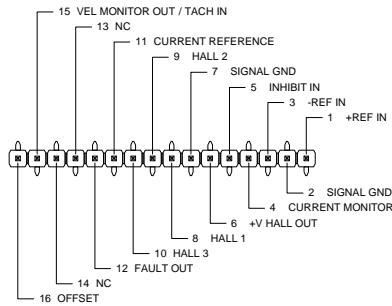
Potentiometers are located between the PCB and the drive baseplate, and are accessible from the side. Potentiometers are approximately linear and have 12 active turns with 1 inactive turn on each end.

| Potentiometer | Description   | Turning CW                           |
|---------------|---|--------------------------------------|
| 1             | Loop gain adjustment for velocity modes. Turn this pot fully CCW in current mode. Located closest to the corner of the PCB. | Increases gain                       |
| 2             | Offset. Used to adjust any imbalance in the input signal or in the amplifier. Located furthest from the corner of the PCB.  | Adjusts offset in negative direction |

**MECHANICAL INFORMATION**

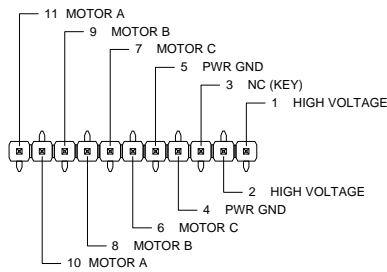
**P1 - Signal Connector**

|                       |                               |                        |
|-----------------------|-------------------------------|------------------------|
| Connector Information | 16-pin, 2.54 mm spaced header |                        |
| Mating Connector      | Details                       | Samtec: BCS-116-L-S-PE |
|                       | Included with Drive           | No                     |



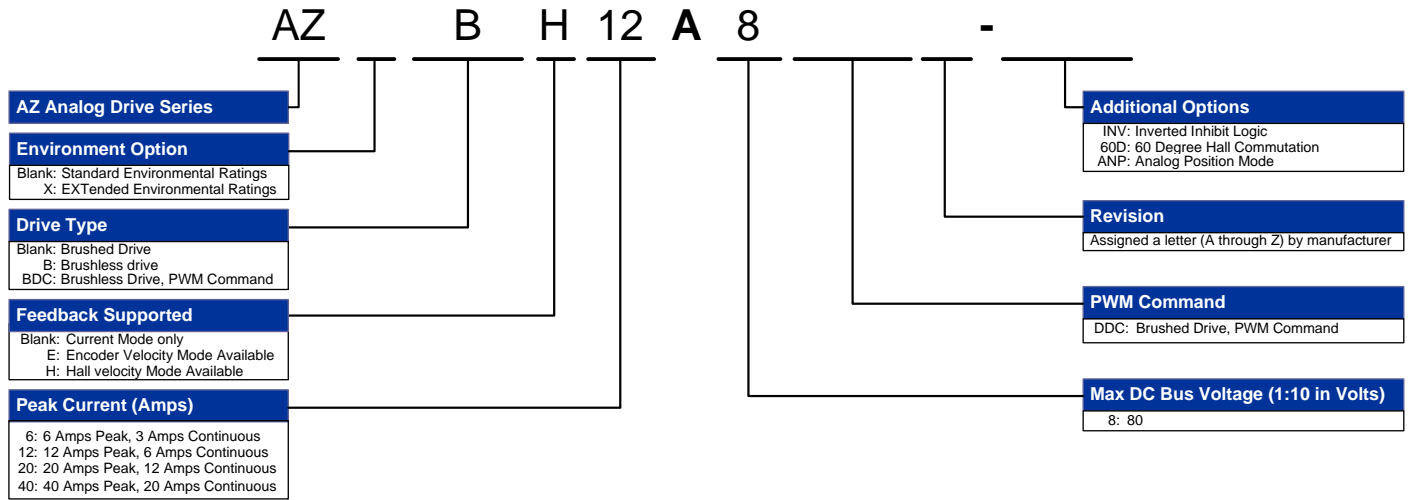
**P2 - Power Connector**

|                       |                               |                        |
|-----------------------|-------------------------------|------------------------|
| Connector Information | 11-pin, 2.54 mm spaced header |                        |
| Mating Connector      | Details                       | Samtec: BCS-111-L-S-PE |
|                       | Included with Drive           | No                     |





**PART NUMBERING INFORMATION**



ADVANCED Motion Controls AZ series of servo drives are available in many configurations. All models listed in the selection tables of the website are readily available, standard product offerings.

ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, ADVANCED Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability.

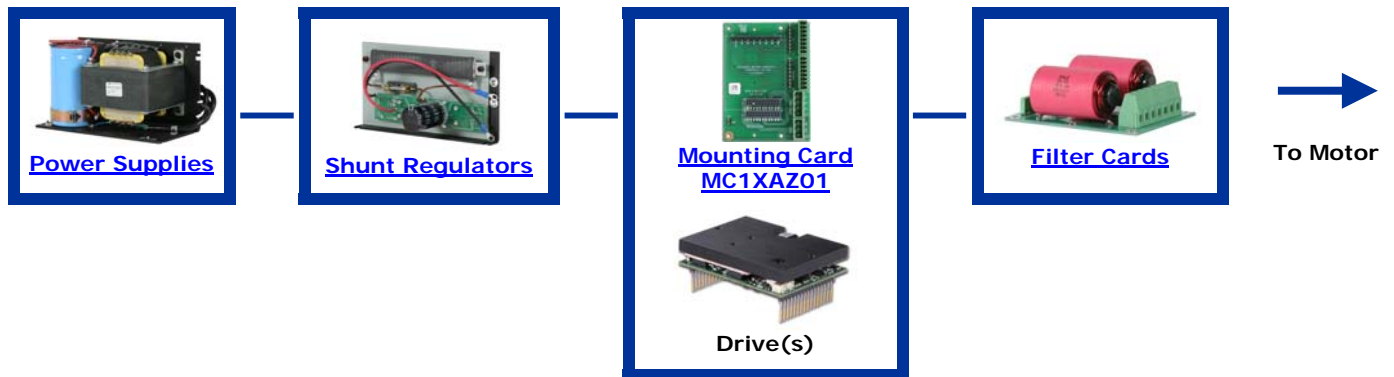
**Examples of Customized Products**

- ▲ Integration of Drive into Motor Housing
- ▲ Mount OEM PCB onto Drive Without Cables
- ▲ Multi-axis Configuration for Compact System
- ▲ Custom PCB and Baseplate for Optimized Footprint
- ▲ RTV/Epoxy Components for High Vibration
- ▲ OEM Specified Connectors for Instant Compatibility
- ▲ OEM Specified Silkscreen for Custom Appearance
- ▲ Increased Thermal Limits for High Temp. Operation
- ▲ Integrate OEM Circuitry onto Drive PCB
- ▲ Custom Control Loop Tuned to Motor Characteristics
- ▲ Custom I/O Interface for System Compatibility
- ▲ Preset Switches and Pots to Reduce User Setup
- ▲ Optimized Switching Frequency
- ▲ Ramped Velocity Command for Smooth Acceleration
- ▲ Remove Unused Features to Reduce OEM Cost
- ▲ Application Specific Current and Voltage Limits

Feel free to contact Applications Engineering for further information and details.

**Available Accessories**

ADVANCED Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit [www.a-m-c.com](http://www.a-m-c.com) to see which accessories will assist with your application design and implementation.



All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.