

**Description**

The AZB10A4 PWM servo drive is designed to drive brushless and brushed 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 AZB10A4 is fully protected against over-voltage, under-voltage, over-current, over-heating, and short-circuits. A single digital output indicates operating status. The drive interfaces with digital controllers that have analog  $\pm 10V$  output. This servo drive requires only a single unregulated isolated DC power supply, and is fully RoHS (Reduction of Hazardous Substances) compliant.

See Part Numbering Information on last page of datasheet for additional ordering options.

**Power Range**

|                    |             |
|--------------------|-------------|
| Peak Current       | 10 A        |
| Continuous Current | 5 A         |
| Supply Voltage     | 10 - 36 VDC |



**Features**

- ▲ Four Quadrant Regenerative Operation
- ▲ Direct Board-to-Board Integration
- ▲ Lightweight
- ▲ High Switching Frequency
- ▲ Wide Temperature Range
- ▲ Differential Input Command
- ▲ Digital Fault Output Monitor
- ▲ Current Monitor Output
- ▲ Single Supply Operation
- ▲ Compact Size
- ▲ High Power Density
- ▲ 12VDC Operation

**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

**FEEDBACK SUPPORTED**

- Hall Sensors

**MODES OF OPERATION**

- Current

**COMMUTATION**

- Trapezoidal

**MOTORS SUPPORTED**

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

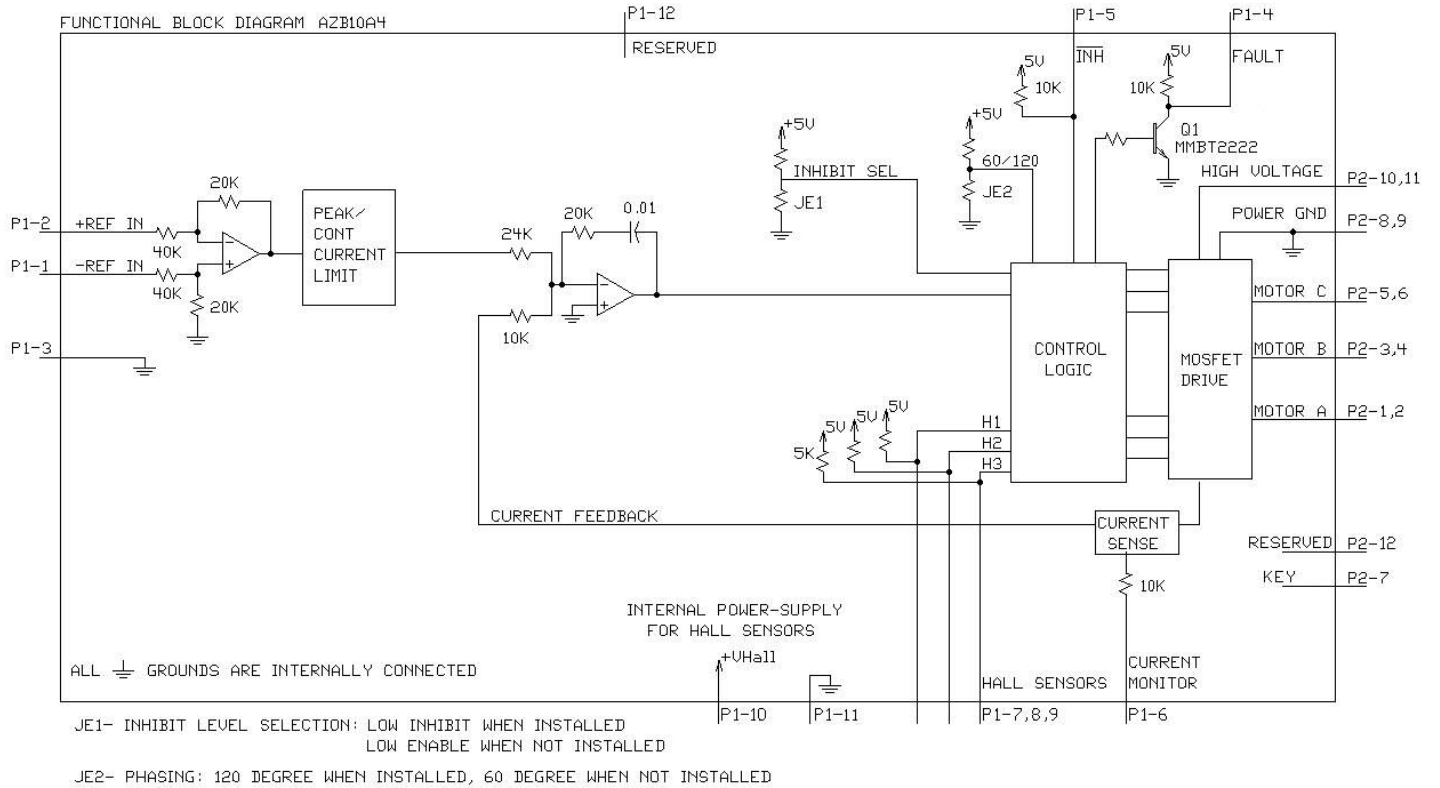
**COMMAND SOURCE**

- $\pm 10 V$  Analog

**COMPLIANCES & AGENCY APPROVALS**

- RoHS
- UL/cUL Pending
- CE Pending

**BLOCK DIAGRAM**



**Information on Approvals and Compliances**



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   | 10 - 36        |
| DC Bus Under Voltage Limit                          | VDC   | 8              |
| DC Bus Over Voltage Limit                           | VDC   | 40             |
| Maximum Peak Output Current <sup>1</sup>            | A     | 10             |
| Maximum Continuous Output Current                   | A     | 5              |
| Maximum Continuous Output Power                     | W     | 171            |
| Maximum Power Dissipation at Continuous Current     | W     | 9              |
| Minimum Load Inductance (Line-To-Line) <sup>2</sup> | μH    | 100            |
| Internal Bus Capacitance <sup>3</sup>               | μF    | 23.5           |
| Low Voltage Supply Outputs                          | -     | +5 VDC (30 mA) |
| Switching Frequency                                 | kHz   | 40             |

| Control Specifications |       |                                                                                                                                       |
|------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| Description            | Units | Value                                                                                                                                 |
| Command Sources        | -     | ±10 V Analog                                                                                                                          |
| Feedback Supported     | -     | Halls                                                                                                                                 |
| Commutation Methods    | -     | Trapezoidal                                                                                                                           |
| Modes of Operation     | -     | Current                                                                                                                               |
| 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                         | -       | RoHS, UL/cUL Pending, CE Pending        |
| Size (H x W x D)                         | mm (in) | 38.1 x 38.1 x 7.34 (1.50 x 1.50 x 0.29) |
| Weight                                   | g (oz)  | 8.5 (0.3)                               |
| Operating Temperature Range <sup>4</sup> | °C (°F) | 0 - 85 (32 - 185)                       |
| Storage Temperature Range                | °C (°F) | -40 - 85 (-40 - 185)                    |
| Relative Humidity                        | -       | 0 - 90% Non-Condensing                  |
| Form Factor                              | -       | PCB Mounted                             |
| P1 Connector                             | -       | 12-pin, 1.27 mm spaced header           |
| P2 Connector                             | -       | 12-pin, 1.27 mm spaced header           |

**Notes**

1. Maximum duration of peak current is ~2 seconds. Peak RMS value must not exceed continuous current rating of the drive.
2. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
3. Requires a minimum of 47 μF external bus capacitance between the DC Supply and Power Ground.
4. 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                     | +REF IN         | Differential Reference Input ( $\pm 10$ V Operating Range, $\pm 15$ V Maximum Input)                                                                                                                                     | I   |
| 3                     | SIGNAL GND      | Signal Ground (Common With Power Ground).                                                                                                                                                                                | GND |
| 4                     | 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   |
| 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                     | CURRENT MONITOR | Current Monitor. Analog output signal proportional to the actual current output. Scaling is 2 A/V. Measure relative to signal ground.                                                                                    | O   |
| 7                     | HALL 3          | Single-ended Hall/Commutation Sensor Inputs (+5 V logic level)                                                                                                                                                           | I   |
| 8                     | HALL 2*         |                                                                                                                                                                                                                          | I   |
| 9                     | HALL 1          |                                                                                                                                                                                                                          | I   |
| 10                    | +V HALL OUT     | Low Power Supply For Hall Sensors (+5 V @ 30 mA). Referenced to signal ground. Short circuit protected.                                                                                                                  | O   |
| 11                    | SIGNAL GND      | Signal Ground (Common With Power Ground).                                                                                                                                                                                | GND |
| 12                    | RESERVED        | Reserved                                                                                                                                                                                                                 | -   |

| P2 - Power Connector |          |                                                                                                                                             |     |
|----------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Pin                  | Name     | Description / Notes                                                                                                                         | I/O |
| 1                    | MOTOR A  | Motor Phase Outputs. Current output distributed equally across 2 pins per motor phase, 3A continuous current carrying capacity per pin.     | O   |
| 2                    | MOTOR A  |                                                                                                                                             | O   |
| 3                    | MOTOR B  |                                                                                                                                             | O   |
| 4                    | MOTOR B  |                                                                                                                                             | O   |
| 5                    | MOTOR C  |                                                                                                                                             | O   |
| 6                    | MOTOR C  |                                                                                                                                             | O   |
| 7                    | NC (KEY) | No Connection. Keyed pin.                                                                                                                   | -   |
| 8                    | PWR GND  | Power Ground (Common With Signal Ground). 3A Continuous Current Rating Per Pin                                                              | GND |
| 9                    | PWR GND  |                                                                                                                                             | GND |
| 10                   | HV IN    | DC Power Input. 3A Continuous Current Rating Per Pin. Requires a minimum of 47 $\mu$ F external capacitance between HV IN and PWR GND pins. | I   |
| 11                   | HV IN    |                                                                                                                                             | I   |
| 12                   | RESERVED | Reserved                                                                                                                                    | -   |

\*For use with Single Phase (Brushed) motors, ground Hall 2 and only connect motor leads to Motor A and Motor B.

**Note:** P1 and P2 are identical 12-pin headers. To avoid damage to the drive, be sure when plugging or soldering the drive into a PCB or interface card that the drive orientation is correct. P1 and P2 are labeled on the PCB silkscreen. Pin 7 on P2 is keyed to differentiate it from P1. Consult the mounting dimension drawing on page 6 of this datasheet for an illustration of the locations of P1 and P2.

**HARDWARE SETTINGS**

**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   |
| JE1    | Inhibit logic. Sets the logic level of inhibit pins. Labeled JE1 on the PCB of the drive.               | Low Enable    | Low Inhibit |
| JE2    | Hall sensor phasing. Selects 120 or 60 degree commutation phasing. Labeled JE2 on the PCB of the drive. | 60 degree     | 120 degree  |

**MECHANICAL INFORMATION**

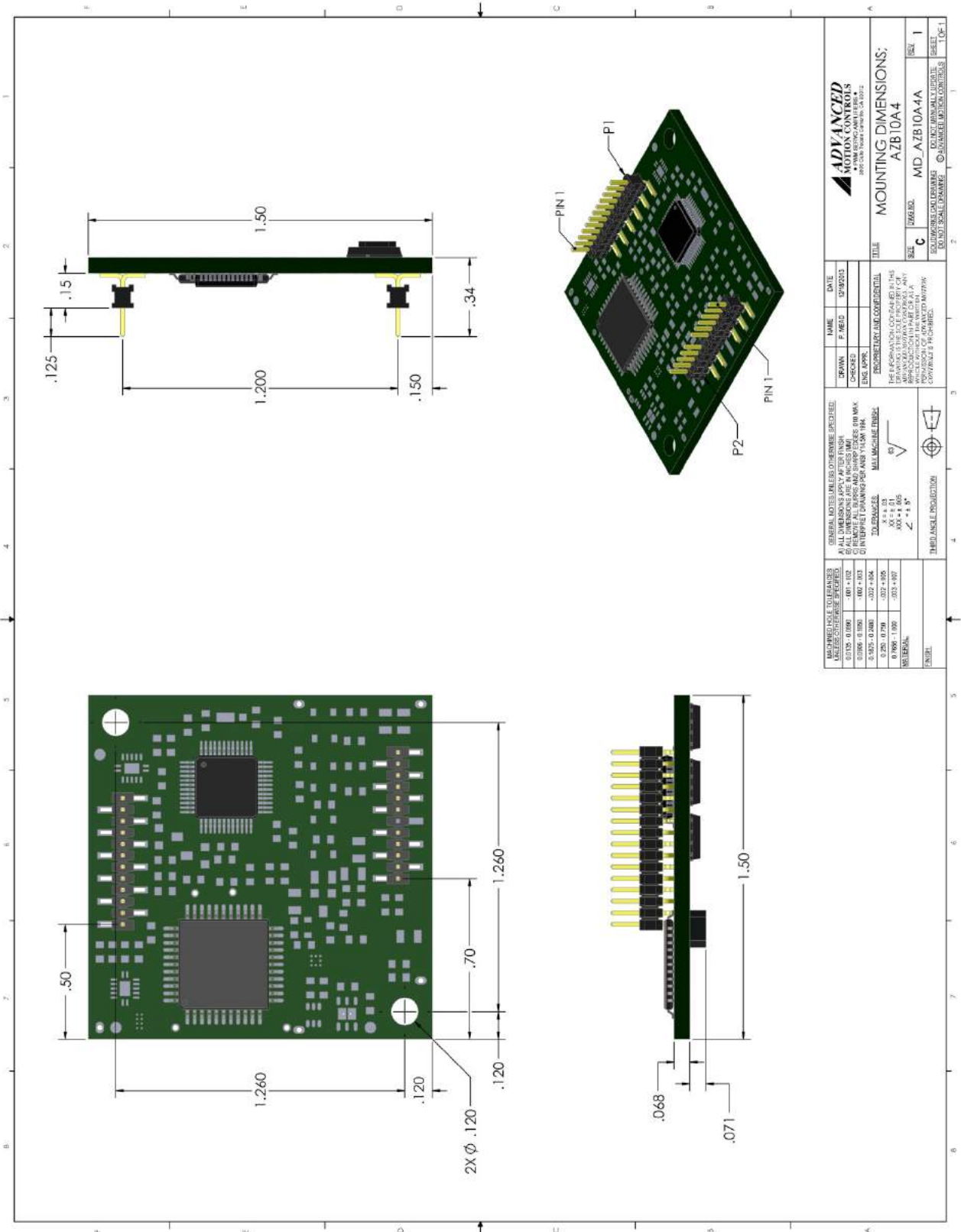
**P1 - Signal Connector**

|                       |                     |                               |
|-----------------------|---------------------|-------------------------------|
| Connector Information |                     | 12-pin, 1.27 mm spaced header |
| Mating Connector      | Details             | Samtec: RSM-112-02-L-S        |
|                       | Included with Drive | No                            |

**P2 - Power Connector**

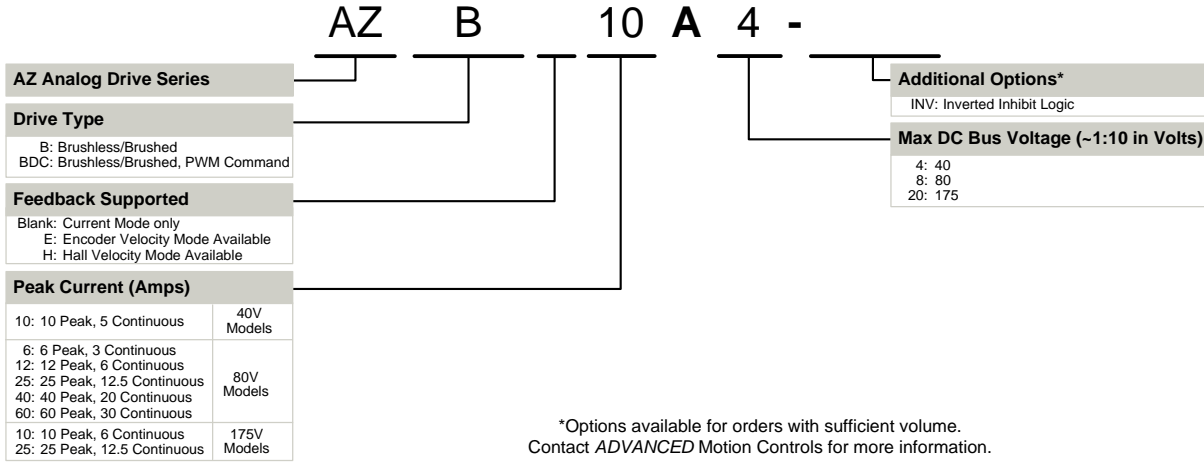
|                       |                     |                               |
|-----------------------|---------------------|-------------------------------|
| Connector Information |                     | 12-pin, 1.27 mm spaced header |
| Mating Connector      | Details             | Samtec: RSM-112-02-L-S        |
|                       | Included with Drive | No                            |

**MOUNTING DIMENSIONS**



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                           |                                                                                       |                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|--------------------|
| <p><b>ADVANCED</b><br/>MOTION CONTROLS<br/>3805 CALLE TECATE, CAMARILLO, CA 93012</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                           | <p><b>ADVANCED</b><br/>MOTION CONTROLS<br/>3805 CALLE TECATE, CAMARILLO, CA 93012</p> |                    |
| <p>NAME: _____<br/>DATE: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>DESIGNED BY: _____<br/>DATE: _____</p> | <p>ENGINEER: _____<br/>DATE: _____</p>                                                | <p>DATE: _____</p> |
| <p>GENERAL NOTES (UNLESS OTHERWISE SPECIFIED):<br/>                 A) ALL DIMENSIONS APPLY AFTER FINISH.<br/>                 B) DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED.<br/>                 C) FINISH ALL SURFACES AND SHARP EDGES PER AWS.<br/>                 D) INTERPRET DIMENSIONS PER ANSI Y14.5M.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                           |                                                                                       |                    |
| <p>TOLERANCES: MILL MACHINE FINISH<br/>                 .0015 ± .01<br/>                 .0025 ± .01<br/>                 .0050 ± .01<br/>                 .0100 ± .01<br/>                 .0150 ± .01<br/>                 .0200 ± .01<br/>                 .0300 ± .01<br/>                 .0400 ± .01<br/>                 .0500 ± .01<br/>                 .0750 ± .01<br/>                 .1000 ± .01<br/>                 .1500 ± .01<br/>                 .2000 ± .01<br/>                 .3000 ± .01<br/>                 .5000 ± .01<br/>                 1.0000 ± .01<br/>                 1.5000 ± .01<br/>                 2.0000 ± .01<br/>                 3.0000 ± .01<br/>                 4.0000 ± .01<br/>                 5.0000 ± .01<br/>                 6.0000 ± .01<br/>                 7.0000 ± .01<br/>                 8.0000 ± .01<br/>                 9.0000 ± .01<br/>                 10.0000 ± .01<br/>                 15.0000 ± .01<br/>                 20.0000 ± .01<br/>                 30.0000 ± .01<br/>                 40.0000 ± .01<br/>                 50.0000 ± .01<br/>                 60.0000 ± .01<br/>                 70.0000 ± .01<br/>                 80.0000 ± .01<br/>                 90.0000 ± .01<br/>                 100.0000 ± .01<br/>                 150.0000 ± .01<br/>                 200.0000 ± .01<br/>                 300.0000 ± .01<br/>                 400.0000 ± .01<br/>                 500.0000 ± .01<br/>                 600.0000 ± .01<br/>                 700.0000 ± .01<br/>                 800.0000 ± .01<br/>                 900.0000 ± .01<br/>                 1000.0000 ± .01<br/>                 1500.0000 ± .01<br/>                 2000.0000 ± .01<br/>                 3000.0000 ± .01<br/>                 4000.0000 ± .01<br/>                 5000.0000 ± .01<br/>                 6000.0000 ± .01<br/>                 7000.0000 ± .01<br/>                 8000.0000 ± .01<br/>                 9000.0000 ± .01<br/>                 10000.0000 ± .01</p> |                                           |                                                                                       |                    |
| <p>FINISH: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                           |                                                                                       |                    |
| <p>THE INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE. IT IS THE PROPERTY OF ADVANCED MOTION CONTROLS AND IS LOANED TO YOUR COMPANY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF ADVANCED MOTION CONTROLS.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                           |                                                                                       |                    |
| <p>SCALE: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                           | <p>SCALE: _____</p>                                                                   |                    |
| <p>DATE: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                           | <p>DATE: _____</p>                                                                    |                    |
| <p>BY: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                           | <p>BY: _____</p>                                                                      |                    |
| <p>FOR: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                           | <p>FOR: _____</p>                                                                     |                    |
| <p>PROJECT: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                           | <p>PROJECT: _____</p>                                                                 |                    |
| <p>SHEET: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                           | <p>SHEET: _____</p>                                                                   |                    |
| <p>TOTAL SHEETS: _____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           | <p>TOTAL SHEETS: _____</p>                                                            |                    |

**PART NUMBERING INFORMATION**



ADVANCED Motion Controls AZ series of servo drives are available in many configurations. Note that not all possible part number combinations are offered as standard drives. 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.

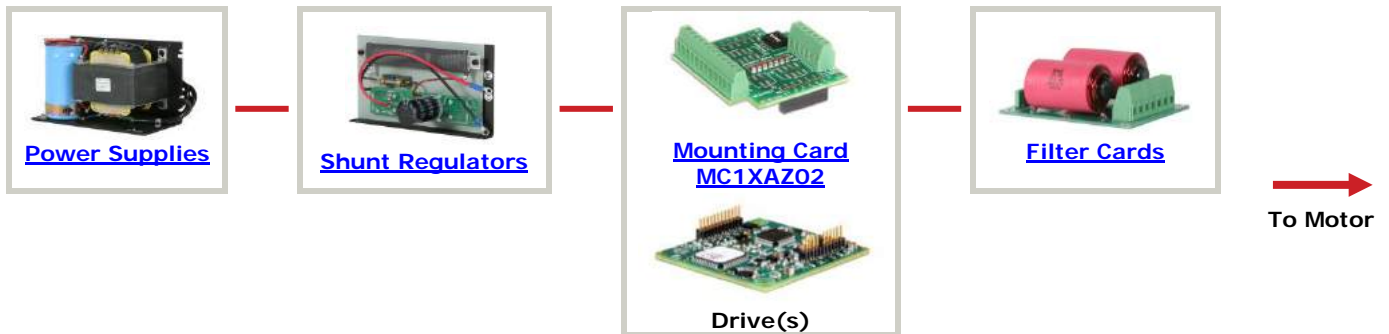
**Examples of Modifications and Customized Products**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>▲ Integration of Drive into Motor Housing</li> <li>▲ Mount OEM PCB onto Drive Without Cables</li> <li>▲ Multi-axis Configuration for Compact System</li> <li>▲ Custom PCB and Baseplate for Optimized Footprint</li> <li>▲ RTV/Epoxy Components for High Vibration</li> <li>▲ OEM Specified Connectors for Instant Compatibility</li> <li>▲ OEM Specified Silkscreen for Custom Appearance</li> <li>▲ Increased Thermal Limits for High Temp. Operation</li> </ul> | <ul style="list-style-type: none"> <li>▲ Integrate OEM Circuitry onto Drive PCB</li> <li>▲ Custom Control Loop Tuned to Motor Characteristics</li> <li>▲ Custom I/O Interface for System Compatibility</li> <li>▲ Preset Switches and Pots to Reduce User Setup</li> <li>▲ Optimized Switching Frequency</li> <li>▲ Ramped Velocity Command for Smooth Acceleration</li> <li>▲ Remove Unused Features to Reduce OEM Cost</li> <li>▲ Application Specific Current and Voltage Limits</li> </ul> |
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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.