TECHNICAL DATASHEET #TDAX100251

40 A BLDC Motor Controller, CANopen®

Variable Speed Control
Onboard I/O
CAN Port (CANopen®)
EDS File for Configuration

P/N: AX100251

Features

- Unidirectional or bi-directional BLDC motor control (Up to 40A continuous output current to the motor)
- Flexible control of speed and torque
- Hall effect sensor feedback (Sensorless control using back EMF is also available in the standard model.)
- 2 universal signal inputs are user selectable as voltage, current, resistive, frequency, PWM, or digital type (For encoder inputs, contact Axiomatic.)
- 1 digital, frequency, or PWM input
- Control inputs (speed, direction, enable) to drive the motor can be mapped to any of the 3 inputs or the controller can respond to messages from the CAN bus.
- 1 universal output (2.5 A proportional) to drive accessories such as hydraulic valves or relays for machine control or safety interlock
- 1 signal output is provided to follow the rotation speed of the motor (voltage or current signal)
- Output can be coded as feedback messages sent to the CAN bus
- Highly efficient and robust design with isolation for drive and processing circuits
- 1 CAN port (CANopen®)
- Operational from 9 to 65 VDC (12, 24 or 48 VDC nominal)
- Operational from -40 to 85 °C (-40 to 185 °F)
- Suitable for high shock and vibration environments
- Rugged and fully sealed IP67-rated corrosion resistant aluminum enclosure
- EDS file for configuration

Applications

Motor variable speed, position, and/or flow control in lift equipment; Electric vehicles for material handling, trucks, cranes, and hoists; Hydraulic tail lifts and winches; Golf carts; Military equipment; Mobile pumps; Hydraulic powerpacks

Ordering Part Number

40 A BLDC Motor Controller, CANopen® - P/N: **AX100251**

SAE J1939, 250 kbps model - P/N**: AX100250**

Accessories:
EDS File
Mating Plugs Kit - P/N: **AX070450**

Axiomatic Technologies Oy
Höytämöntie 6
33880 LEMPÄÄLÄ, Finland
Tel. +358 103 375 750
salesfinland@axiomatic.com
www.axiomatic.fi

Axiomatic Technologies Corporation
1445 Courtneypark Dr. E.
Mississauga, ON Canada L5T 2E3
Tel. 1 905 602 9270
sales@axiomatic.com
www.axiomatic.com

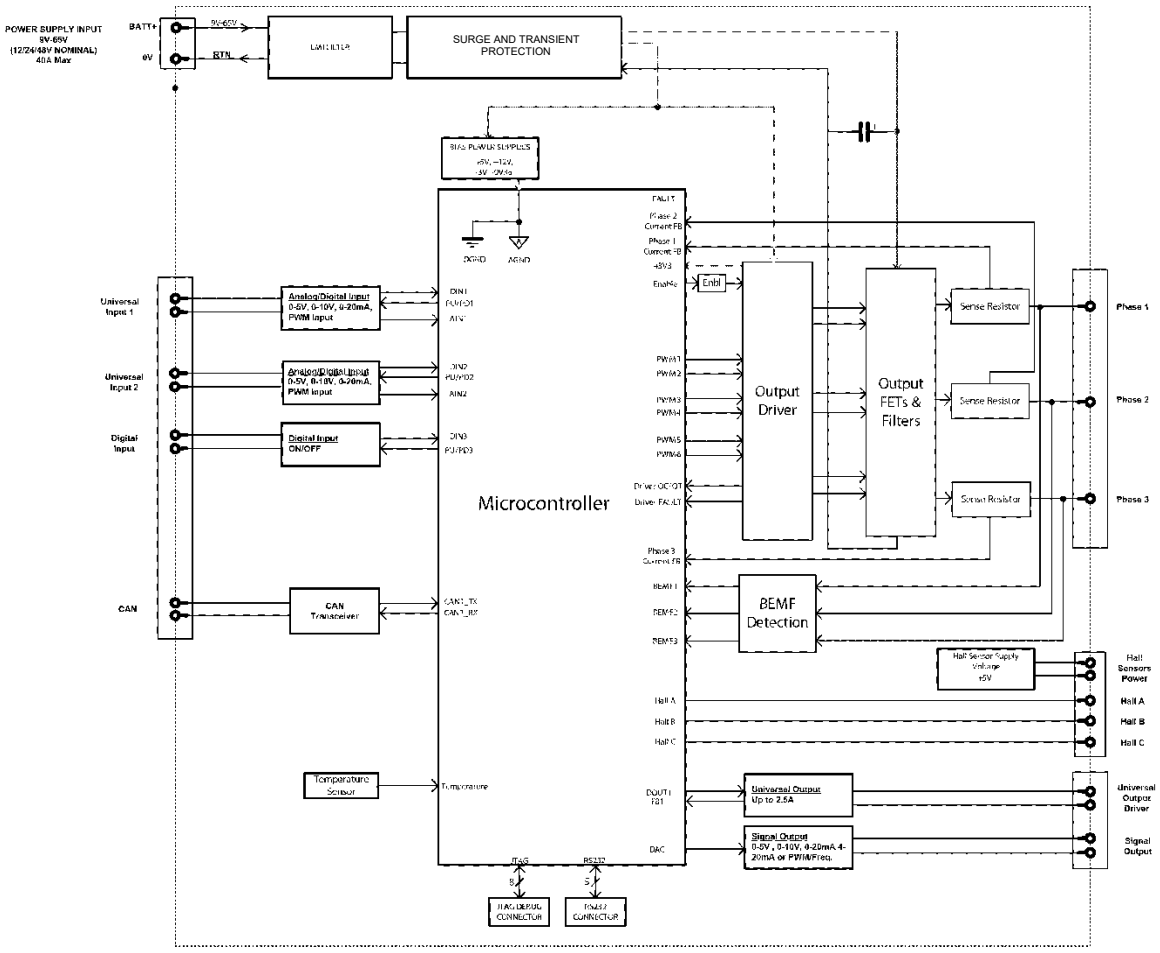

Figure 1 – Block Diagram

Technical Specifications

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Approvals/Limitations and Return Materials Process as described on https://www.axiomatic.com/service/.

All specifications are typical at nominal input voltage and 25 degrees C unless otherwise specified.

Power Input

Power Input	12, 24, or 48 VDC nominal (9 to 65 VDC)
Quiescent Current	70.2 mA @ 12 VDC; 37.3 mA @ 24 VDC; 18 mA @ 48 VDC typical
Surge Protection	120 VDC

Inputs

Universal / Resistive Inputs	2 universal or resistive signal input properties are user configurable. (For encoder inputs, contact Axiomatic.) 12-bit analog to digital resolution Protected against shorts <u>Voltage Input:</u> Range: 0-5 or 0-10 VDC Resolution:1 mV Accuracy: ±1 % error <u>Current Input:</u> Range: 4-20 or 0-20 mA Resolution:1 µA Accuracy: ±1 % error Current sense resistor: 249 Ω <u>Resistive Input</u>: Range: 30 Ω to 250 kΩ Accuracy: ±2 % error (up to 100 kΩ), ±10 % error (up to 250 kΩ) <u>Frequency Input:</u> Auto-Ranging: 0.5 Hz to 10 kHz Resolution: 1 Hz Accuracy: ±1 % error <u>PWM Signal:</u> Range: 0.5 Hz to 10 kHz Duty Cycle : 0 to 100 % Accuracy: ±1 % error <u>Digital Input:</u> Active high with 10 KΩ pull-up resistor or active low with 10 KΩ pull-down resistor Amplitude: up to +Vps
Digital Input	1 input is provided <u>Frequency Input:</u> Auto-Ranging: 0.5 Hz to 10 kHz Resolution: 0.01% Accuracy: ±1% error <u>PWM Signal:</u> Range: 0.5 Hz to 10 kHz Duty Cycle : 0 to 100% Resolution: 0.01% Accuracy: ±1% error <u>Digital Input:</u> Active high with 10 KΩ pull-up resistor or active low with 10 KΩ pull-down resistor Amplitude: up to +Vps These inputs can be used as an enable or direction command for the controller.
Hall Sensor Inputs (for Motor Feedback)	3 Hall effect sensor inputs 10 KΩ pull-up to +5 V per input 1 voltage supply (+5 V) and 1 ground connection is provided. Sensorless control using back EMF is also available in the standard model.

Outputs

Output to BLDC Motor	1x output (3x pins) to run 1x BLDC motor 40 A continuous current at 12, 24, or 48 VDC (nominal) The maximum rated speed and motor rated current are configurable to suit individual motor specifications. Overcurrent protection is provided at 50 A. Short circuit protection is provided.
Motor Stop	Shut off with or without ramping
Motor Direction	Motor direction command can be mapped to any input or come from the CAN bus.
Motor Control Mode	Flexible control is provided by user configurable parameters for speed and torque control loops. The control input to drive the motor can be mapped to either of the 2 universal inputs or the controller can respond to messages from a CAN bus.
Thermal Protection	Thermal protection is built-in and configurable.
Universal Output	1 output is selectable as: <u>Proportional Current:</u> Range: 0-2.5 A Resolution:1 mA Accuracy: ±1 % error <u>Hotshot Digital:</u> Current: 2.5 A <u>PWM Duty Cycle;</u> Current: 2.5 A Resolution: 0.01% Accuracy: ±1 % error <u>On/Off Digital:</u> Current: 2.5 A Sourcing from power supply or output off Half-bridge output, current sensing, grounded load High side sourcing up to 2.5 A High frequency drive Load at supply voltage must not draw more than 2.5 A Ramp and dither setpoints are configurable. Overcurrent protection Short circuit protection **Hotshot Coil Saver Output:** The output is on/off with a hotshot current which keeps the load ON with a holding current. This is used as an energy saving method of load control. The output is configurable to send a feedback message to the CAN bus. The feedback is always sent as a word with a resolution of 1 mA/bit and 0 mA offset. Refer to Proportional Output Hotshot Digital Profile.
Analog Output	1 voltage or current output is provided to follow the rotation speed of the motor. 12-bit digital to analog (voltage, current) Protected against short to Ground or +Vcc 1 signal output Ground is provided. <u>Voltage Output:</u> Range: 0-5 or 0-10 VDC Resolution:1 mV Accuracy: ±1 % error <u>Current Output:</u> Range: 4-20 or 0-20 mA Resolution:1 µA Accuracy: ±1 % error Current sense resistor: 249 Ω
Voltage Reference (for Hall Sensors)	1 voltage supply (+5 V) and 1 ground connection is provided.

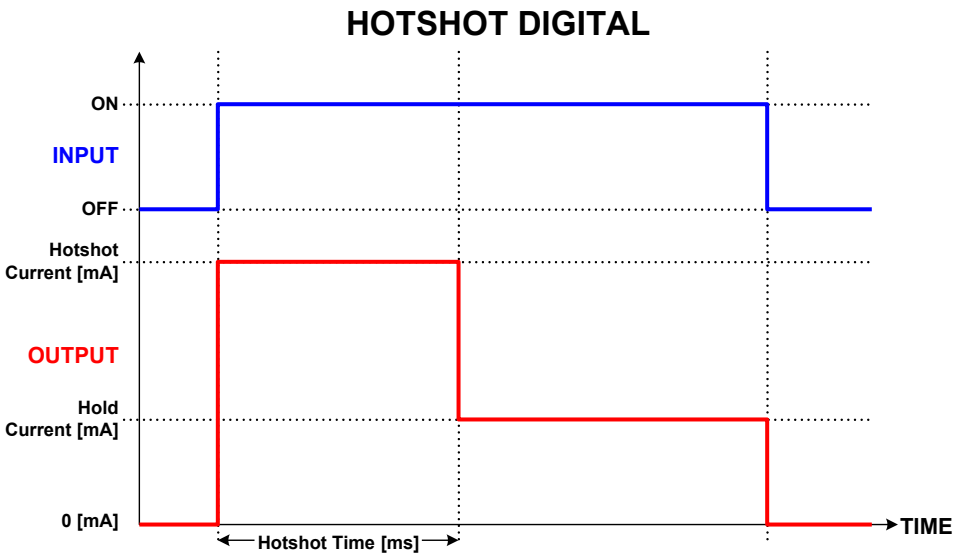

Figure 2 – Hotshot Digital Output Profile

General Specifications

Microcontroller	TMS320F280049
Motor Control	Standard embedded software is provided. The following parameters are user configurable. Motor Direction: Uni-directional or bi-directional control from an input or the CAN bus. The direction is also configurable. Enable: A universal input can be configured to enable the motor when on. A CAN message can also be used as an enable input. Control Mode: Open loop speed or closed loop speed, open loop torque or closed loop torque CAN: CAN bus messages control the motor and/or auxiliary outputs instead of the analog or digital inputs
Communication	1 CAN port (CANopen®) Supported baud-rates: 10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s (default), 250 kbit/s, 500 kbit/, 800 kbit/s, and 1 Mbit/s SAE J1939 model: AX100250
User Interface	EDS file is provided to interface with the unit using standard CANopen® tools.
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Storage Temperature	-50 to 125 °C (-58 to 257 °F)
Vibration	MIL-STD-202H, method 204, test condition C 10 g peak (Sine) MIL-STD-202H, method 214A, test condition I/B 7.56 Grms (Random)
Shock	MIL-STD-202H, method 213B, test condition A 50 g peak
Weight	3.75 lb. (1.695 kg)
Protection	IP67
Enclosure	Encapsulated in an anodized aluminum extrusion with gasket 8.95 in. x 6.67 in. x 2.88 in. (227.4 mm x 169.3 mm x 73.2 mm) (W x L x H including connectors, excluding mating connectors) Refer to Dimensional Drawing.

Electrical Connections

<table>
<tr><td>Electrical Connections</td><td>
Power Connector:
Molex P/N: 19436-0213
Mates with Molex P/N: 19432-0013
<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>1</td><td>Battery +</td></tr>
<tr><td>2</td><td>Battery -</td></tr>
</table>
Motor Connector:
TE Deutsch P/N: HD10-3-96P
Mates with TE Deutsch P/N: HD16-3-96S
<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>1</td><td>Motor A Output</td></tr>
<tr><td>2</td><td>Motor B Output</td></tr>
<tr><td>3</td><td>Motor C Output</td></tr>
</table>
Signal, Hall Effect and CAN Connector:
TE Deutsch P/N: DTM13-12PA
Mates with TE Deutsch P/N: DTM06-12SA
<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>1</td><td>Universal / Resistive Input 2</td></tr>
<tr><td>2</td><td>Analog Output</td></tr>
<tr><td>3</td><td>Hall Sensor A</td></tr>
<tr><td>4</td><td>Hall Sensor C</td></tr>
<tr><td>5</td><td>Universal Output</td></tr>
<tr><td>6</td><td>CAN Low</td></tr>
<tr><td>7</td><td>CAN High</td></tr>
<tr><td>8</td><td>Hall Sensor Ground</td></tr>
<tr><td>9</td><td>Hall Sensor B</td></tr>
<tr><td>10</td><td>Hall Sensor 5 V Supply</td></tr>
<tr><td>11</td><td>Digital Input 1</td></tr>
<tr><td>12</td><td>Universal / Resistive Input 1</td></tr>
</table>
</td></tr>
<tr><td>Mating Connectors and Cables</td><td>Wires should be of the appropriate gauge to meet requirements of applicable electrical codes and suit the specifications of the connector(s).

A mating plug kit comprised of all mating connectors is available under P/N: AX070450
(includes 1x plug DTM06-12SA, 1x socket HD16-3-96S, 1x wedgelock WM12S,
12x contacts 0462-201-20141, 3x contacts 0462-201-16141, 1x wedgelock 19432-0013,
and 2x terminals 19434-0003).</td></tr>
<tr><td>Mounting</td><td>The motor controller should be mounted as close to the battery and/or the motor as possible. Install the unit with appropriate space available for servicing and for adequate wire harness access and strain relief. Mounting ledges include holes sized for M6 or ¼ in. bolts. The bolt length will be determined by the end-user's mounting plate thickness. Typically, 20 mm (3/4 in.) is adequate.</td></tr>
</table>

Note: CANopen® is a registered community trademark of CAN in Automation e.V.

Dimensional Drawing

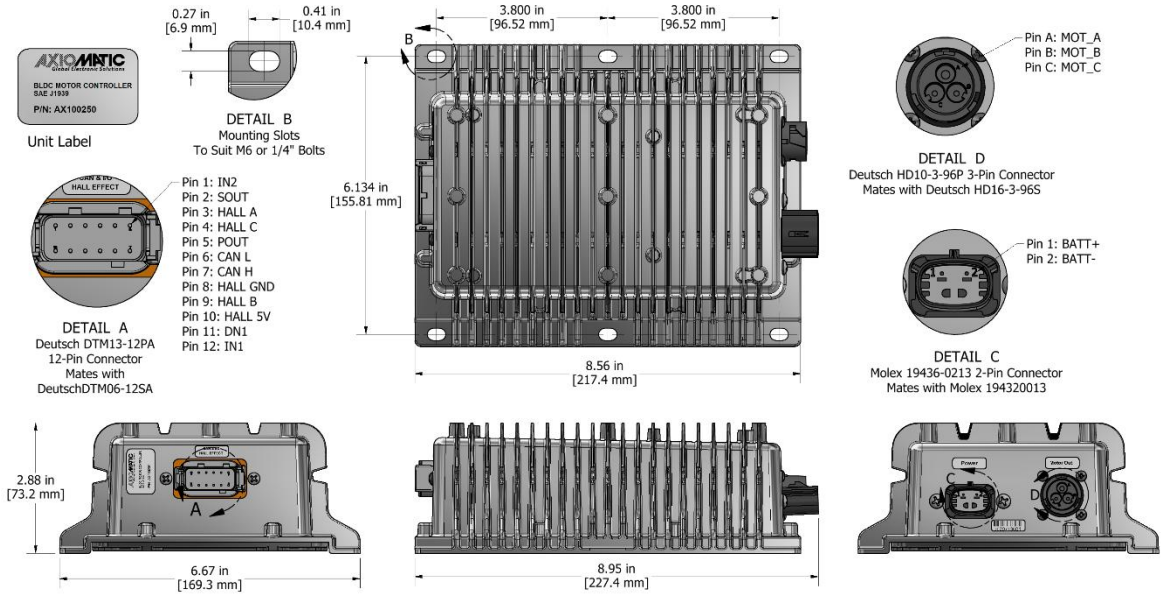

Figure 3 – Dimensional Drawing

Form: TDAX100251-11/17/2025