

TECHNICAL DATASHEET #TDAX100261  
**BLDC MOTOR CONTROLLER**  
**P/N: AX100261**

*Variable Speed Control, Onboard Inputs  
 100W Nominal Output  
 CANopen®, Rugged Packaging  
 High Temperature Operation*

**Features:**

- Unidirectional or bi-directional BLDC motor control
- Up to 100W nominal continuous output power to the motor
- Hall effect sensor feedback or sensorless operation
- Flexible control with user selectable modes:
  - Open Loop Speed
  - Closed Loop Speed;
  - Current control;
  - Position control;
  - or PID control.
- Three (3) Universal inputs are user configurable as Voltage, Current, Resistive, PWM, Frequency, or Digital types.
- One (1) input is user configurable as Voltage, Current or Resistive type.
- The control input to drive the motor can be mapped to any of the universal inputs or the controller can respond to messages from a CAN bus.
- User configurable enable function can be mapped to any of the inputs or a CAN message
- Direction control can be mapped to any of the inputs or a CAN message
- Output can be coded as feedback messages sent to the CAN bus
- 1 reference voltage (5V, 200 mA max.) are provided to power an external sensor or potentiometer
- Highly efficient and robust design
- Operational from 9 - 36Vdc (12 or 24Vdc nominal)
- 1 CAN port (CANopen®) is provided
- Compact size for easy mounting
- Suitable for moist, high shock and vibration environments
- Fully sealed with a rugged IP67 enclosure
- Operational up to 125°C temperature



**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 and Hydraulic Powerpacks

**Ordering Part Numbers:**

BLDC Motor Controller, CANopen P/N: **AX100261**  
 BLDC Motor Controller, CANopen, 10K Hall Effect Pull-up P/N: **AX100261-10K**

EDS File

**Accessories: Mating Plugs Kit P/N: PL-DTM06-12SA-12SB**

**Description:** The BLDC Motor Controller has three universal inputs that can be configured to measure voltage, current, frequency, PWM duty cycle, resistance or digital voltage level (on/off). A fourth input can be an analog input (voltage, current or resistive type). It accepts 12Vdc or 24Vdc nominal input power. The controller can drive brushless DC motors equipped with Hall sensors up to 100W nominal. Sensorless motor control using Back-EMF rotor position detection is also supported. Refer to Figure 1.0.

Measured input data can be sent to a CANopen® CAN Network as is or used in the BLDC controller function blocks for controlling how the BLDC motor is driven.

A rugged enclosure, IP67 rating and high temperature operation up to 125°C ensure that the controller is suitable for mounting in harsh equipment environments.

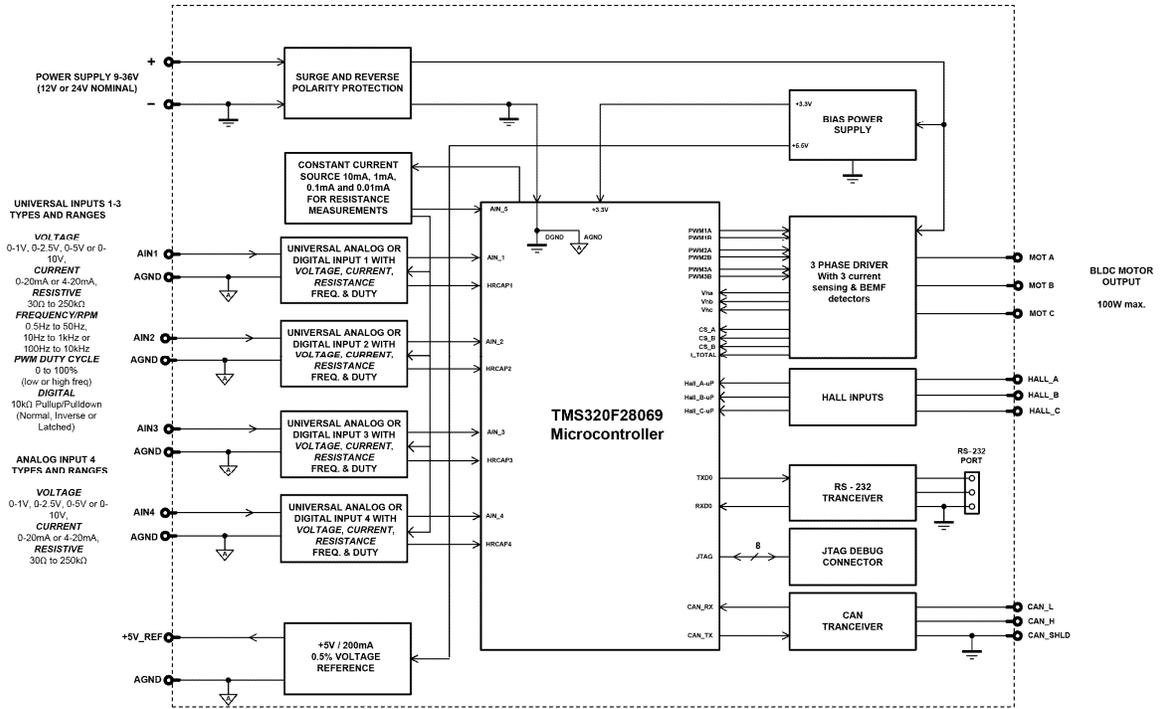


Figure 1 - Block Diagram

## Technical Specifications:

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

### Input Specifications

Power Supply Input - Nominal	12 or 24Vdc nominal (9...36Vdc)
Reverse Polarity Protection	Provided up to -80Vdc
Surge Protection	Provided
Under-voltage Protection	Built-in
Signal Inputs	<p>Three (3) universal inputs are user selectable as: Voltage; Current; Resistive; PWM; Frequency; or Digital types.</p> <p>One (1) input is user configurable as: Voltage; Current; or Resistive types.</p> <p>12-bit Analog to Digital resolution Protected against short to ground Amplitude: up to +Vsupply</p> <p>Input properties are user configurable. Refer to the block diagram and Table 1.0. Any input on the controller can be coded into a Proprietary B message that can be sent to the CAN network.</p>

Analog/Digital Ground	Four (4) are provided.
Motor Feedback	<p>Hall Effect Sensor  Standard open collector/drain hall input type  +5V supply and ground connection pins are provided.  Model AX100261: 1K Pullup to +5V per input  Model AX100261-10K: 10K Pullup to +5V per input</p> <p>Sensorless operation is also available.</p>

<b>Table 1.0 Inputs to AX100260 (Up to 4 user selectable inputs)</b>	
Inputs	Description
Universal Signal Inputs 1-3	<p>Up to 3 universal signal inputs are available.</p> <p>Voltage Input Types: 0...5VDC or 0...10VDC  1mV resolution, accuracy +/- 1% error  The offset is in millivolts and the resolution is mV/bit, when sending a CAN message.  Input measurement setpoints are interpreted in volts.</p> <p>Current Input Types: 4...20mA or 0...20mA  1uA resolution, accuracy +/- 1% error  The offset is in microamps and the resolution is <math>\mu</math>A/bit, when sending a CAN message.  Input measurement setpoints are interpreted in milliamps.  Current sense resistor 249<math>\Omega</math></p> <p>Resistive Type with Auto Ranging and Self Calibration:  20 <math>\Omega</math> to 250K<math>\Omega</math>, +/- 1% error</p> <p>PWM Input Type:  PWM Signal Frequency: 1.3kHz to 15kHz  PWM Duty Cycle: 0 to 100%  0.01% resolution, accuracy +/- 1% error</p> <p>Frequency Input Type: 1.3kHz to 15kHz</p> <p>Digital Input Types: Normal, Inverse and Latched  Active High with 10K Pullup resistor  or Active Low with 10K Pulldown resistor  These inputs can be used as an enable or direction command for the controller.  The input accepted is active high (switch is connected to a +V signal when ON).</p>
Signal Input 4	<p>Signal Input 4 is user selectable as:</p> <p>Voltage Input Types: 0...5VDC or 0...10VDC  1mV resolution, accuracy +/- 1% error  The offset is in millivolts and the resolution is mV/bit, when sending a CAN message.  Input measurement setpoints are interpreted in volts.</p> <p>Current Input Types: 4...20mA or 0...20mA  1uA resolution, accuracy +/- 1% error  The offset is in microamps and the resolution is <math>\mu</math>A/bit, when sending a CAN message.  Input measurement setpoints are interpreted in milliamps.  Current sense resistor 249<math>\Omega</math></p> <p>Resistive Type with Auto Ranging and Self Calibration:  20 <math>\Omega</math> to 250K<math>\Omega</math>, +/- 1% error</p>

## Output Specifications

Output to Motor	<p>3 phase, H-bridge, current sensing per each phase          6A @ 24VDC nominal continuous          6A @ 12VDC nominal continuous          100W nominal power rating          Sensorless or hall sensor operation</p> <p>Overcurrent protection is provided at 12A.          Short circuit protection is provided.          The maximum rated speed and motor rated current are configurable to suit individual motor specifications.</p>
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	<p>Flexible control is provided by user configurable parameters for</p> <ul style="list-style-type: none"> <li>➤ Open loop speed</li> <li>➤ Closed loop speed;</li> <li>➤ Current control;</li> <li>➤ Position control; or</li> <li>➤ PID control.</li> </ul> <p>The control input to drive the motor can be mapped to any of the universal inputs or the controller can respond to messages from a CAN bus.</p>
Thermal Protection	Thermal protection is built-in and configurable.
Reference Voltage	<p>1 +5V, +/- 0.5%, 200 mA          Four connection points are provided for ease of installation.</p>

## General Specifications

Microprocessor	TI TMS320F28069, 32-bit, 256 KB flash program memory, 100 KB RAM
Motor Control	Standard embedded software is provided. Refer to the User Manual.
Diagnostics	There are 3 Diagnostic blocks that can be configured to monitor various parameters of the Controller. Refer to the User Manual for details.
User Interface	Standard CANopen tools (not supplied)
Flashing over CAN	The controller software can be reflashed over the CAN connection using the EA.
CAN port	1 CAN port (CANopen®.)
Weight	0.60 lb. (0.27 kg)
Operating Conditions	-40°C to +125°C (-40°F to 257°F)
Protection Rating	IP67
Enclosure and Dimensions	<p>High Temperature Nylon housing - Deutsch IPD PCB Enclosure (EEC-325X4B)          4.63 x 5.25 x 1.42 inches 117.60 x 133.45 x 35.98 mm          (W x L x H excluding mating plugs)          Refer to Figure 2.0.</p>
Electrical Connections	<p>Deutsch DTM series 24 pin receptacle (DTM13-12PA-12PB-R008)</p> <p>Refer to Table 4.          Wires should be of the appropriate gauge to meet requirements of applicable electric codes and suit the specifications of the connector(s).</p>
Mating Plug Kit	A mating plug kit comprised of all mating connectors is available as P/N: PL-DTM06-12SA-12SB. It includes: Deutsch DTM06-12SA; DTM06-12SB: 2 wedgelocks WM12S; and 24 contacts 0462-201-20141. 20 AWG wire is recommended for use with contacts 0462-201-20141.
Mounting	<p>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.</p> <p>Mounting holes sized for ¼ inch or M6 bolts. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.63 inches (16 mm) thick. If the module is mounted without an enclosure, it should be mounted vertically with connectors facing left and right to reduce likelihood of moisture entry. The CAN wiring is considered intrinsically safe. The power wires are not considered intrinsically safe and so in hazardous locations, they need to be located in conduit or conduit trays at all times. The module must be mounted in an enclosure in hazardous locations for this purpose.</p> <p>All field wiring should be suitable for the operating temperature range.</p>

Grey Connector		Black Connector	
Pin #	Function	Pin #	Function
1	CAN_L	1	+5V Reference
2	HALL_GND	2	Input 1
3	HALL_B	3	Input GND
4	HALL_5V	4	+5V Reference
5	MOTOR_C	5	Input 2
6	Batt +	6	Input GND
7	Batt -	7	+5V Reference
8	MOTOR_B	8	Input 3
9	MOTOR_A	9	Input GND
10	HALL_A	10	+5V Reference
11	HALL_C	11	Input 4
12	CAN_H	12	Input GND

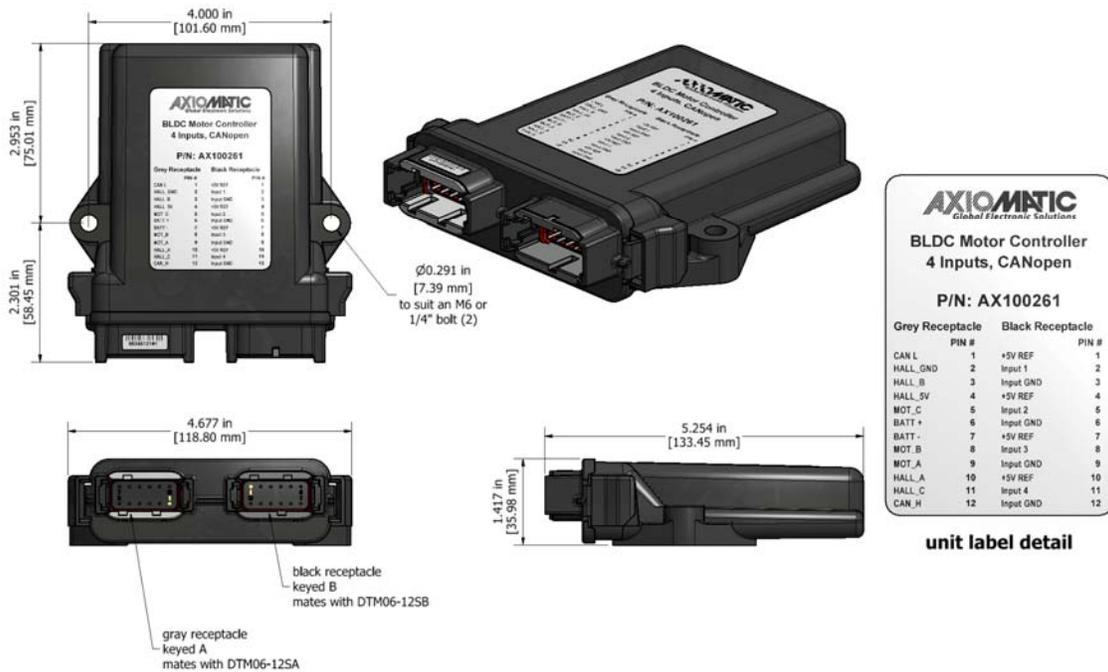


Figure 2 - Dimensional Drawing

Notes:

CANopen® is a registered community trade mark of CAN in Automation e.V.

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 [www.axiomatic.com/service.html](http://www.axiomatic.com/service.html).

Form: TDAX100261-02/28/19