

allocortech inc.

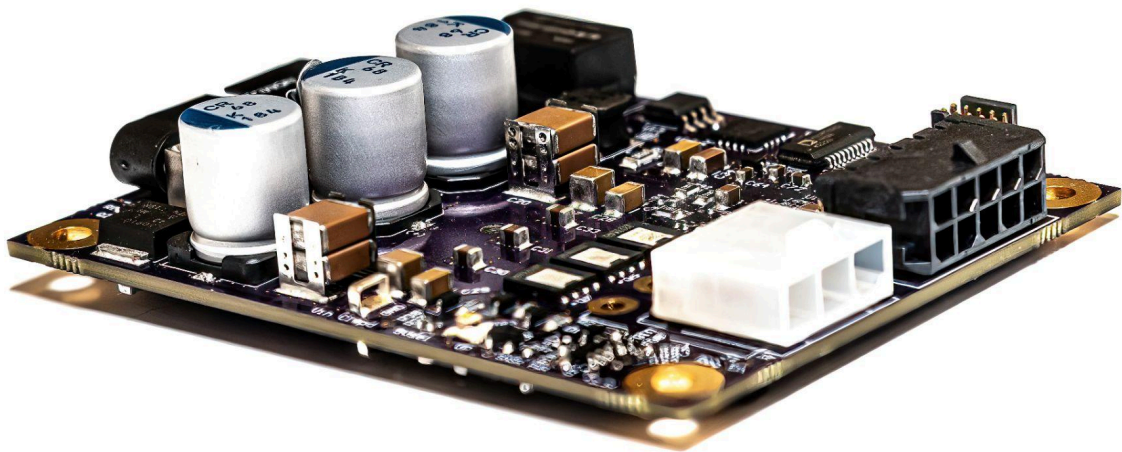
# Taurus AE Physical ICD

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601-0057-000

Revision B

June 2024



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## Version History

Revision	Changes
A	Initial Release
B	Updated Maximum Input Voltage



# Introduction

The allocortech inc Taurus AE (Actuator Edition) is a BLDC motor controller that implements full FOC/SVPWM for high efficiency operation up to 2kW peak power. The Taurus AE has isolated communications channels configurable for CAN 2.0, RS-422/485, or RS-232. It also provides general-purpose digital output/input, which can be configured for PWM output/input capture. A set of 4 digital sensor inputs can either be used for Hall sensor input or Quadrature Encoder input signals from the motor. Additionally, there are 2 differential analog sensor inputs that may be used for measuring motor temperature or other analog sensors.

## Scope of this Document

This document covers the mechanical and electrical specifications of the allocortech Inc Taurus AE (part number 100-0063 and variants). The software development interfaces will be covered in other documents.

## List of Abbreviations

<b>4W RS485</b>	Four wire, full duplex, differential serial (aka RS-422) with RS-485 line levels.
<b>BLDC</b>	Brushless DC (motor)
<b>CAN</b>	Controller Area Network, serial protocol ISO 11898
<b>EMI</b>	Electromagnetic Interference
<b>GND</b>	Power or Digital Ground, isolated from Chassis Ground
<b>GPI</b>	General Purpose Input
<b>GPO</b>	General Purpose Output
<b>PWM</b>	Pulse Width Modulation

## References

CAN 2.0 Specification



# Electrical Interface

## Connector Pinouts

### J1 - Primary Connector

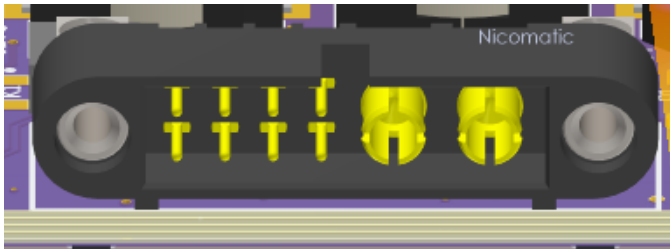
Part Number: 221V08F26-0200-3400CM

#### Recommended Mating Part Numbers

- 222S08M16C-0200-4310 (16-20AWG HP)
- 222S08M16C-0200-4315 (14AWG HP)
- 222S08M16C-0200-4320 (12AWG HP)

#### Backshells:

- Simple Potting Dam Backshell: 14487-21
- Straight, RA, and 45° backshells also available



4	3	2	1	HP2	HP1
8	7	6	5		

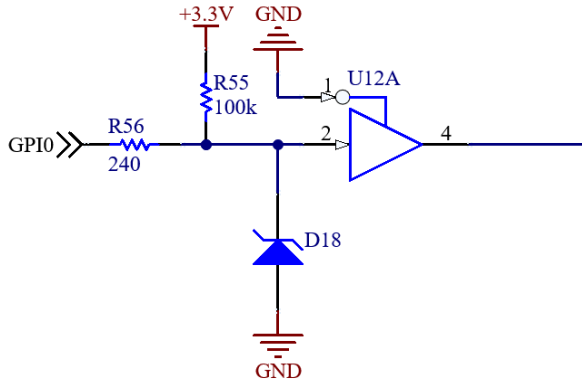
Pin	Name	Primary Function	Alternate Function A	Alternate Function B
HP1	VIN	Primary Power Input (+)	-	-
HP2	GND	Primary Power Input (-)	-	-
1	RS232 TX	RS-232 Transmit	-	RS-422 RX+
2	RS232 RX	RS-232 Receive	-	RS-422 RX-
3	CAN_H	CAN High	RS-485+	RS-422 TX+
4	CAN_L	CAN Low	RS-485-	RS-422 TX-
5	GPO0	General-Purpose Output (channel 0)	-	-
6	GPI0	General-Purpose Input (channel 0)	-	-
7	GND	Reference ground for GPI0/GPO0	-	-
8	ISO-GND	Isolated reference ground for pins 1-4 (RS-232, RS-485, RS-422 and CAN)	-	-

Isolated signals support up to 400V isolation from the primary power input.



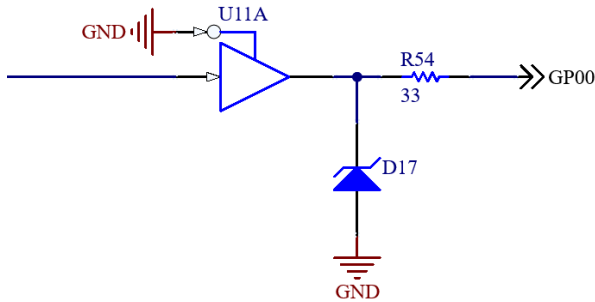
**VIN/GND Primary Power Input:** 18-52V, see Electrical Ratings for details.

### General Purpose Input



Specification	Rating
Input Clamp Current	-20mA (max)
$V_{IH}$ High-Level Input Voltage	1.39V
$V_{IL}$ Low-Level Input Voltage	0.65V
Voltage Max (Continuous)	8.1V
Voltage Min (Continuous)	-4.8V

### General Purpose Output



Specification	Rating
$I_{out}$ Continuous	+/-25mA
High-Level Output Current	-7mA @ 3.3V -8mA @ 5V
Low-Level Output Current	7mA @ 3.3V 8mA @ 5.0V
$V_{OH}$	2.9V@3.3V / -5.5mA 4.6V@5.0V / -8mA
$V_{OL}$	0.1V @ 20μA

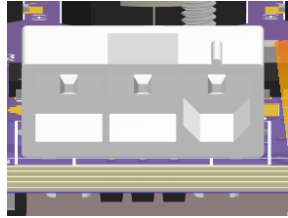
Note: compensation for 33Ω series resistor not included.



## J2 - Motor Connector

Part number: Molex 39-30-3037

Recommended Mating Part Number: Molex 39-01-4030



3	2	1
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Pin	Name	Notes
1	Motor Phase W	13A Continuous
2	Motor Phase V	13A Continuous
3	Motor Phase U	13A Continuous

## J4 - Sensor Connector

Part Number: Molex 43045-1000

Recommended Mating Part Number: Molex 43025-1000

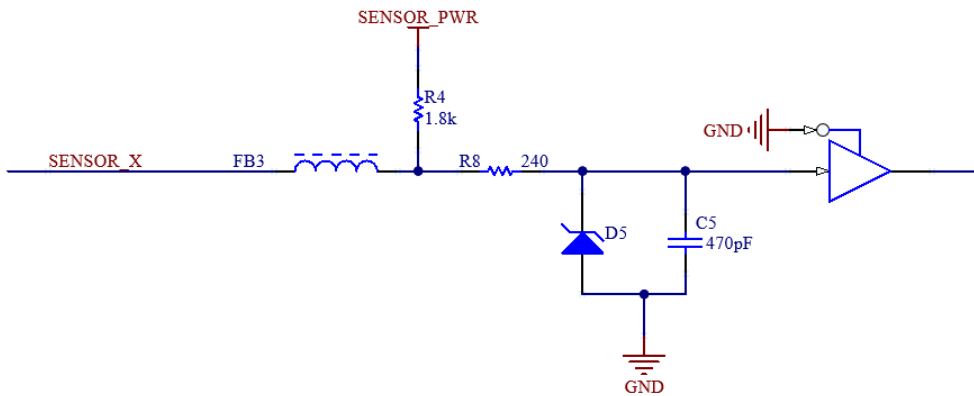


10	9	8	7	6
5	4	3	2	1

Pin	Name	Function	Alt Function	Notes
1	SENSOR_GND	Hall GND	QEP GND	Connected to power ground.
2	M_TEMP_A+	-	-	Analog Input A
3	M_TEMP_A-	-	-	Reference for Analog Input A
4	M_TEMP_B+	-	-	Analog Input B
5	M_TEMP_B-	-	-	Reference for Analog Input B
6	SENSOR_VDD	Hall Power	QEP Power	3.3V (default), Software configurable to 5V. 250mA Current Limit
7	SENSOR_A	Hall A	QEP Index	Input, 1.8kΩ pull-up to SENSOR_VDD
8	SENSOR_B	Hall B	QEP Phase A	Input, 1.8kΩ pull-up to SENSOR_VDD
9	SENSOR_C	Hall C	QEP Phase B	Input, 1.8kΩ pull-up to SENSOR_VDD
10	SENSOR_D	-	-	Input, 1.8kΩ pull-up to SENSOR_VDD



## Hall/QEP Sensor Inputs



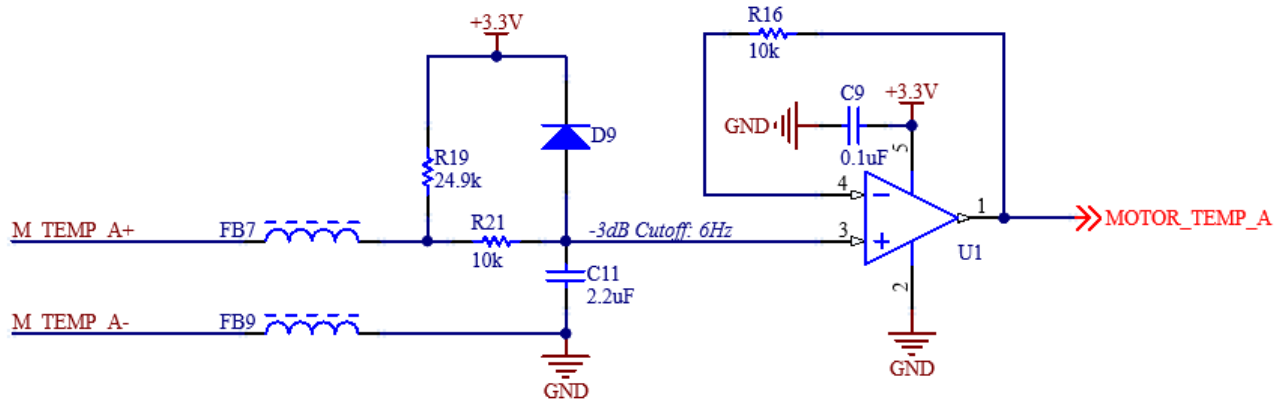
Each sensor input has a 1.8k $\Omega$  pull-up for the case of open-collector output Hall sensors. The signal is also filtered through a 240 $\Omega$ /470pF ( $F_c = 1.4\text{MHz}$ ) RC low-pass filter. Then all 4 input sensor signals enter a logic buffer with <4.8ns delay.

Specification	Rating
$V_{IH}$ High-Level Input Voltage	2.0V
$V_{IL}$ Low-Level Input Voltage	0.8V
Voltage Max (Continuous)	6.3V
Voltage Min (Continuous)	-3.0V





## Analog Inputs



Both analog inputs are electrically equivalent to the above circuit. Alternate resistor configurations are available on request to achieve different gains.

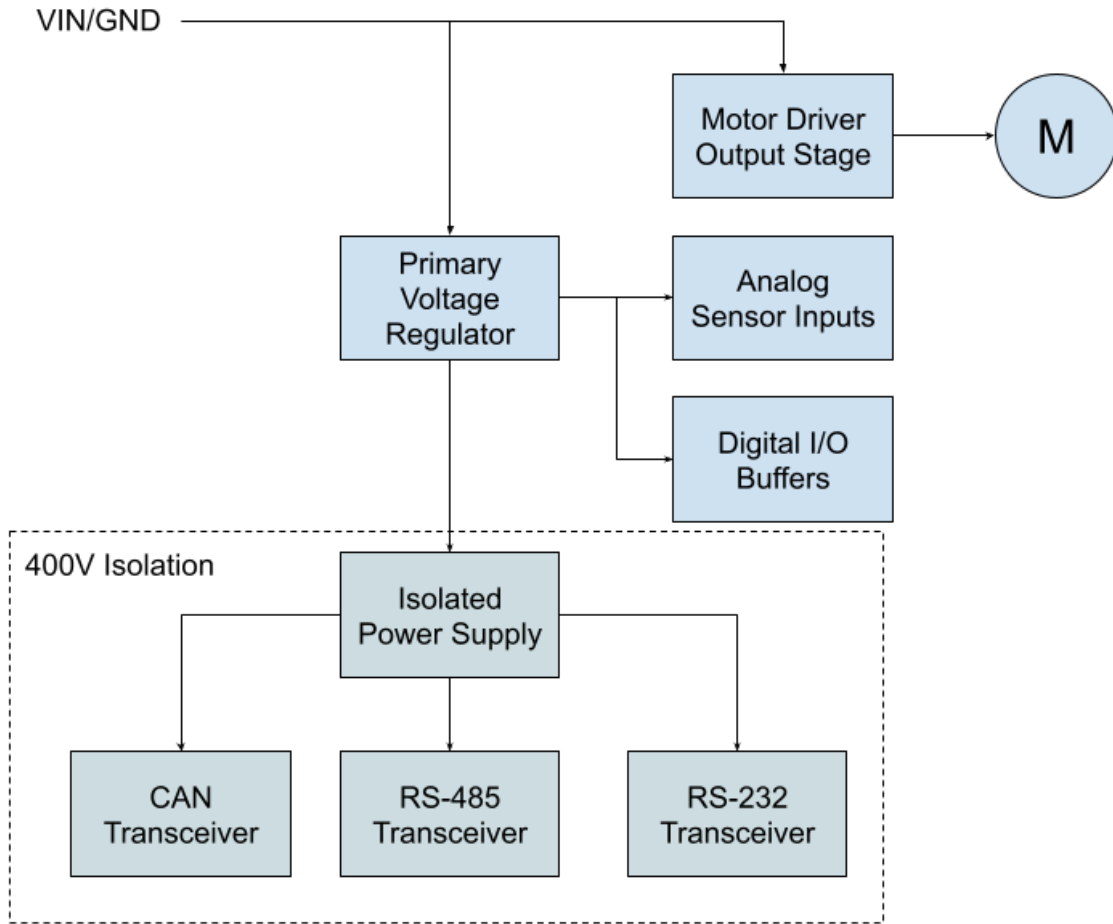
Standard software will measure temperature from a 10k $\Omega$  NTC thermistor with  $\beta = 3490K$  (e.g. NXRT15XV103FA1B040).



# Functional Interface

## Power Topology

The communications signals (CAN, RS-485/RS-422, RS-232) are isolated from the main power input. However, some signals, specifically motor sensor inputs and digital input/output signals are not isolated, and are referenced to the main power ground.





## Absolute Maximums

Parameter	Min	Max	Units
Input Voltage on VIN	-0.5 *	52	V
VIN Current	±20 (continuous) ±30 (peak)		A
System/Idle Power	1.0	1.5	W
Motor Power	0	1200 (continuous) 1800 (peak)	W
GPI0 Voltage to GND	-4.8	8.1	V
GPO0 Voltage to GND	-1.3	SENSOR_VDD + 1.3	V
SENSOR_A/B/C/D to GND	-3.8	SENSOR_VDD + 3.8	V
CAN Common Mode to ISO-GND	-2	+7	V
RS-485 Common Mode to ISO-GND	-25	+25	V
RS-485 Transient Fault Protection to ISO-GND	-65	+65	V
RS-232 RX to ISO-GND	-25	+25	V
RS-232 TX to ISO-GND	-13.2	+13.2	V
GND to ISO-GND	-400	+400	V

\* The Taurus-AE can withstand up to 8A in the case of reverse power polarity.



## Communications Parameters

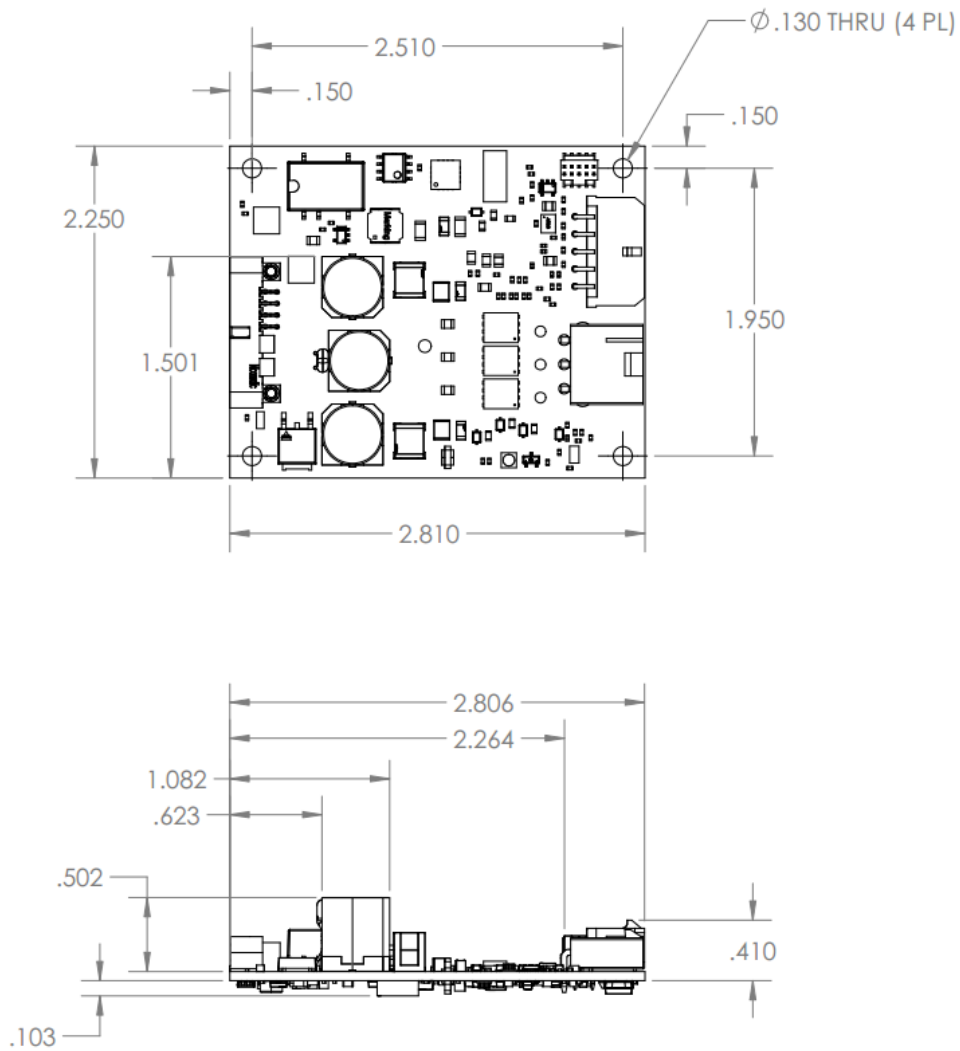
Parameter	Min	Nom	Max	Units
CAN Differential Output Voltage (dominant)	1.5		3.0	V
CAN Differential Output Voltage (recessive)	-0.12		0.012	V
RS-422/485 Differential Output	1.5 @ 54Ω			V
RS-422/485 Common Mode Output Voltage		2.5	3	V
RS-422/485 Input Rising Threshold	40		200	mV
RS-422/485 Input Falling Threshold	-200		-40	mV
RS-232 TX High Level	5.0	5.4		V
Low Level		-5.4	-5.0	V
RS-232 RX High threshold		1.8	2.4	V
Low threshold	0.8	1.5		V
Operating limit	-25		+25	V

For more detailed information, see the datasheets for the following transceivers:

RS-232	MAX3227
CAN 2.0	SN65HVD255D
RS-422/485	MAX14775



# Mechanical Interface



Measurements given in inches.

## Mounting Holes

- 4x 0.130"
- 2.510" x 1.950" square pattern
- Plated, electrically isolated

Weight: 37 g



# Environmental

## Temperature

Operating: -40°C to 105°C

Storage: -40° to 105°C

On-board temperature sensors are included at the following locations. The specific limits are as follows, which software should adhere to. These thresholds assume adequate air flow and/or heat sinking of the Taurus-AE.

Device	Recommended Limit
Inverter MOSFETs	125°C
Internal Processor	125°C
Bulk Capacitor	105°C

Note: RS-232 not available across the full temperature range.