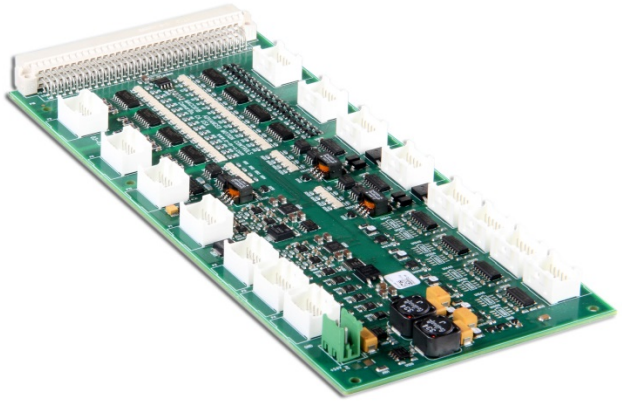
Description

The Motion Automation Control Card (MACC) family are general purpose motion/automation controllers with embedded Click&Move® programming capability.

Most applications for the MACC platform require digital and/or analog input/output hardware elements. *ADVANCED* Motion Controls® offers a wide range of input/output modules to fulfill any application requirement. These modules are partial or fully customizable to fit the application specifications and budget.

The MACCIO1 module features the necessary digital and analog I/O's to support up to four current mode servo drives with ±10V analog command input. A cost-effective and high performance motion control system can be built using the hardware resources of the MACC on-board FPGA and the software resources of the Click&Move® software development environment.

The MACCIO1 can fit other data acquisition applications as well.



Click&Move®

Automation Solution

FEATURES

- 8 fully differential analog inputs
  - 16-bit resolution
  - ±10V input range
  - Up to 2µs sampling rate (inputs 1-4 and 5-8 are simultaneously sampled)
- 8 fully differential analog outputs
  - 16-bit resolution
  - ±10V output range
  - Up to 10µs update rate
- 16 optocoupled digital inputs
- 16 optocoupled digital outputs
- 4 high-speed RS422 differential digital inputs
- 8 high-speed RS422 differential digital outputs
- 4 independent encoder inputs
  - Quadrature incremental encoder with index channel
    or
  - EnDat® 2.2 absolute encoder
- Fits standard DIN rail plastic case

CUSTOMIZATION OPTIONS

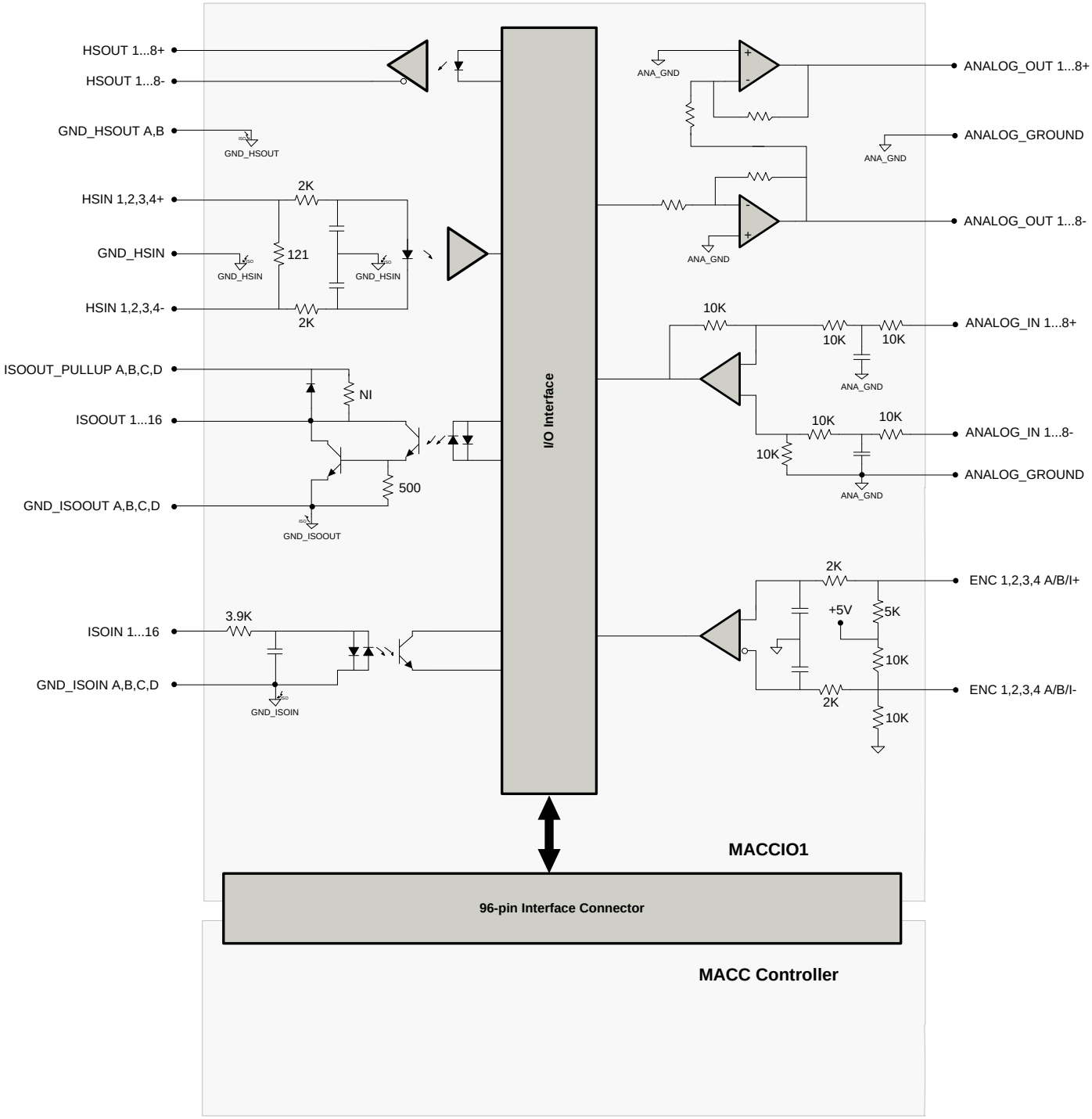
- Analog input voltage range
- Analog input resolution
  - 12, 14, or 16-bit
- 2nd order low pass filter to analog inputs 1-4
- Analog output voltage range
- Analog output resolution
  - 12, 14, or 16-bit
- Remove galvanic isolation of high-speed digital I/O
- Select quadrature or absolute encoder input sections on a per encoder basis

COMPATIBLE CONTROL CARDS

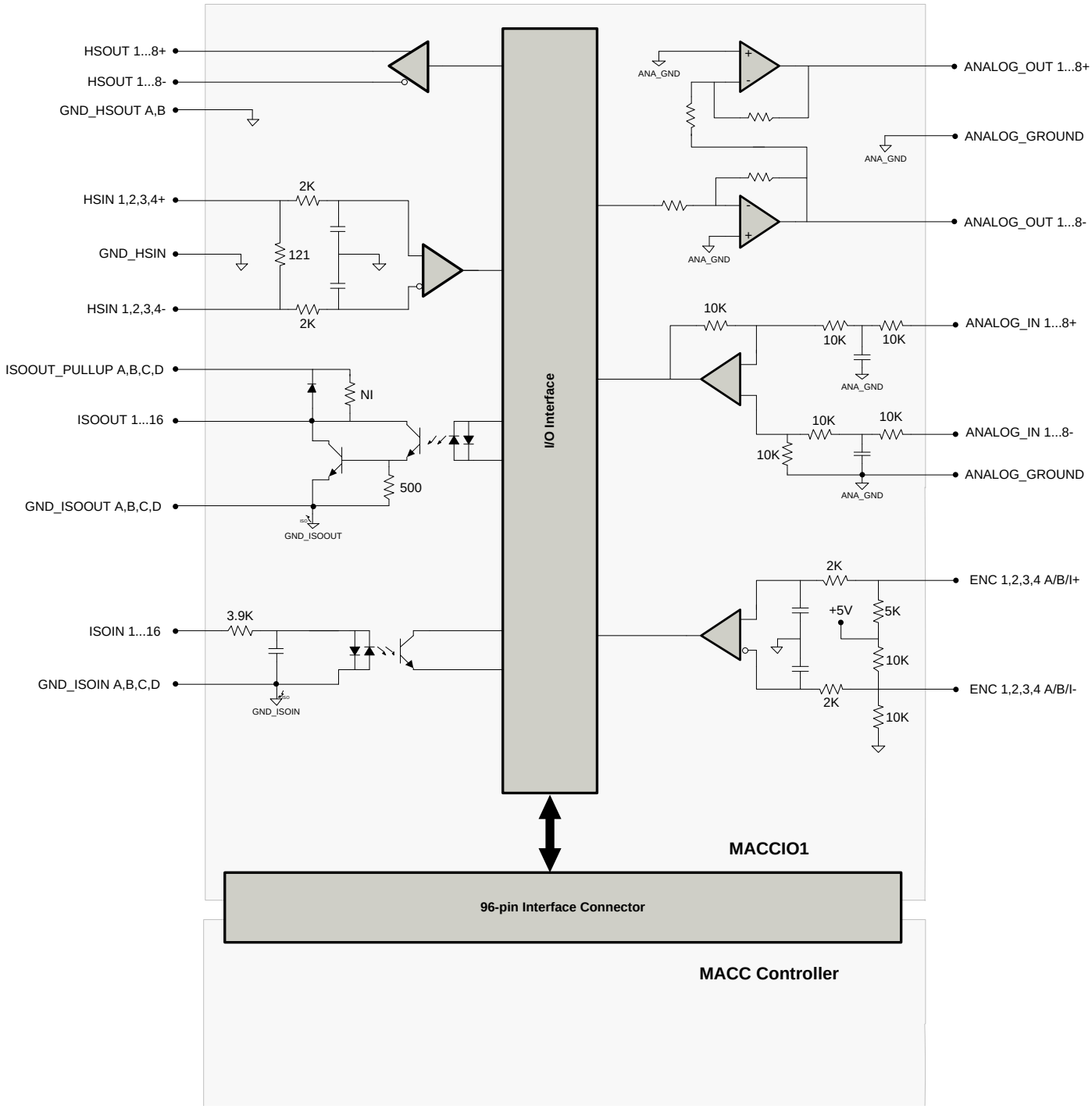
- MACC02
- MACC11

BLOCK DIAGRAMS

Galvanically Isolated High-Speed I/O Board Population Option



Non-Galvanically Isolated High-Speed I/O Board Population Option

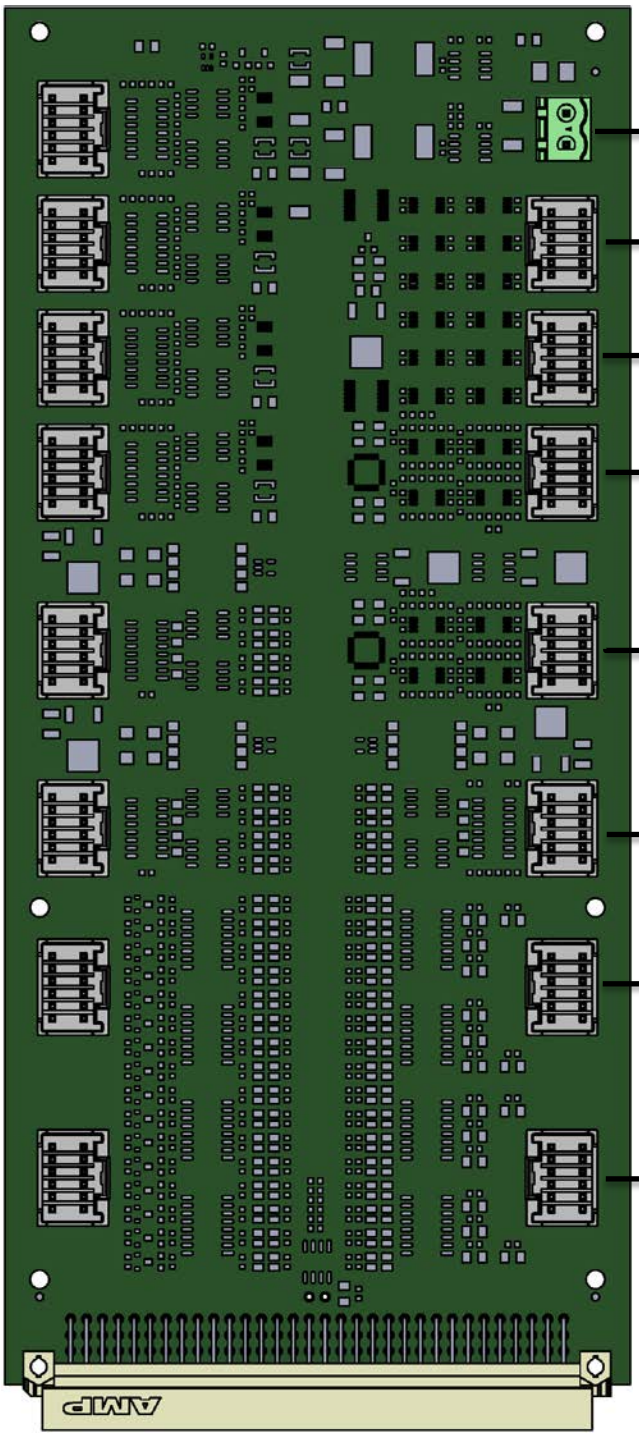


SPECIFICATIONS

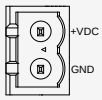
Power Specifications		
Description	Units	Value
DC Supply Voltage	VDC	Directly from the MACC, no external power supply required
I/O Specifications		
Description	Units	Value
Isolated Digital Outputs		
Maximum Turn On Delay	µs	10
Typical Turn Off Delay	µs	130 (@ 240 ohm pull-up to 24V)
Typical Saturation Voltage	V	1 (@ 100 mA load)
Maximum Continuous Output Current	mA	100
Maximum Peak Output Current	mA	250 (@ 50% duty cycle)
Maximum Output Voltage	V	30
Isolated Digital Inputs		
Maximum Turn On Delay	µs	4 (@ 24 V input)
Maximum Turn Off Delay	µs	60
Minimum Input Voltage	V	18
Maximum Input Voltage	V	30
Isolated Differential High-Speed Outputs (RS422)		
Typical Turn On/Off Delay	ns	70
Isolated Differential High-Speed Inputs (RS422)		
Typical Turn On/Off Delay	ns	250
Analog Outputs		
Maximum Output Current	mA	±10
Analog Inputs		
Maximum Input Voltage	V	±12
Mechanical Specifications		
Description	Units	Value
Agency Approvals	-	UL Pending, cUL Pending, CE Pending, RoHS II
Size (H x W x D)	mm (in)	219.96 x 99.95 x 13.60 (8.66 x 3.94 x 0.54)
Weight	g (oz)	153.1 (5.4)
Operating Temperature Range	°C (°F)	0 - 75 (32 - 167)
Storage Temperature Range	°C (°F)	-40 - 85 (-40 - 185)
I/O Connectors	-	12-pin, 2.00 mm spaced dual-row vertical or right-angled headers
MACC INTERFACE I/O Connector	-	96-pin, 2.54 mm spaced plug connector
(Optional) POWER Connector	-	2-port, 5.08 mm spaced, enclosed, friction lock header

Information on Approvals and Compliances	
RoHS II Compliant	The RoHS II Directive 2011/65/EU restricts the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment.

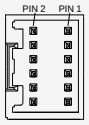
CONNECTOR INFORMATION



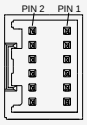
P17 – (Optional) Power Connector
- 2-pin, 5.08 mm spaced enclosed friction lock header
- 24 VDC Power Supply Connection
- Mating Connector Included (Phoenix Contact: P/N 1757019)



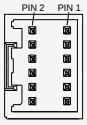
P3 and P4 – Analog Output Connectors
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)



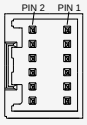
P1 and P2 – Analog Input Connectors
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)



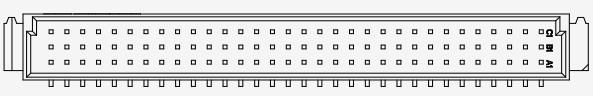
P11 – Differential High Speed Digital Input Connector
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)



P5 and P6 – Digital Input Connectors
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)

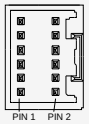


P16 – MACC Interface I/O Connector
- 96-pin, 2.54 mm spaced plug connector
- I/O Module control card interface

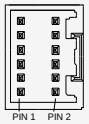


CONNECTOR INFORMATION (CONT.)

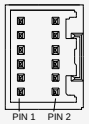
P12, P13, P14, and P15 – Encoder Input Connectors
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)

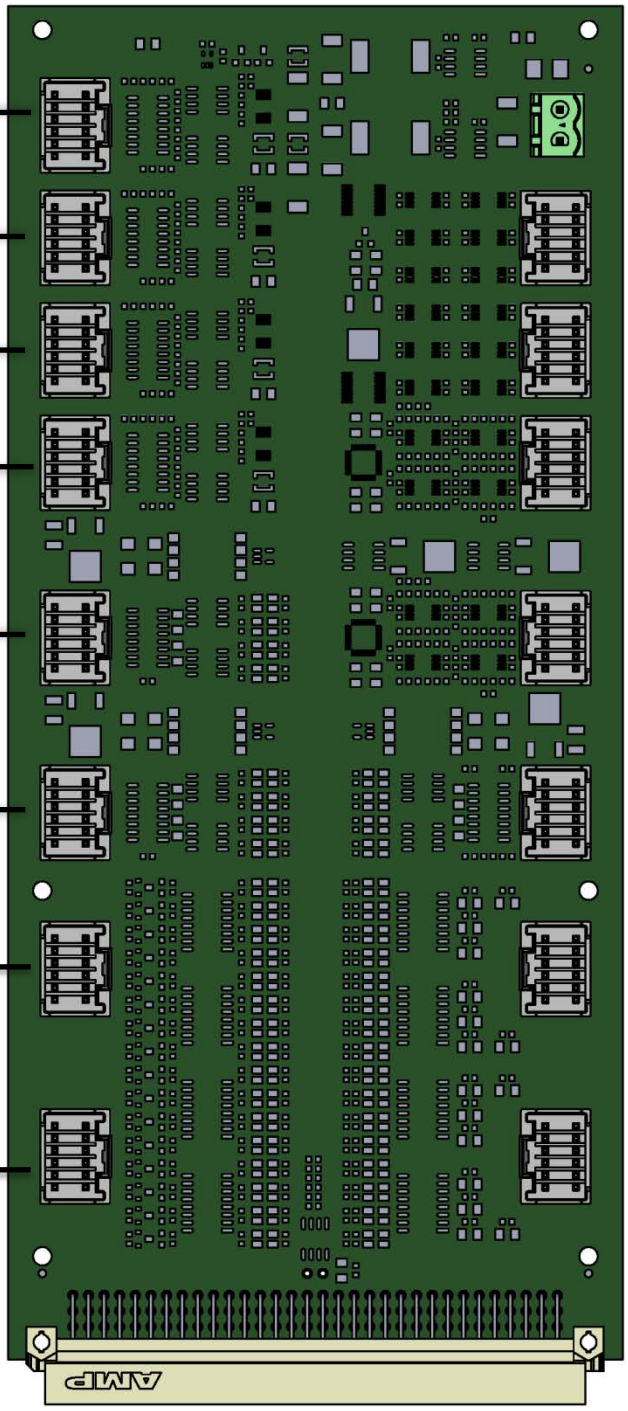


P9 and P10 – Differential High Speed Digital Output Connectors
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)



P7 and P8 – Digital Output Connectors
- 12-pin, 2.00 mm spaced dual-row vertical header (Molex P/N 55917-1210)
- Mating Connector (Molex:P/N 51353-1200)





PIN FUNCTIONS

P1 – Analog Inputs Connector

Pin	Name	Description / Notes	I/O
1	ANALOG_GROUND	Analog Ground	AGND
2	ANALOG_GROUND	Analog Ground	AGND
3	ANALOG_IN_6+	Differential analog positive input	I
4	ANALOG_IN_5+	Differential analog positive input	I
5	ANALOG_IN_6-	Differential analog negative input. For single-ended use, connect to analog ground.	I
6	ANALOG_IN_5-	Differential analog negative input. For single-ended use, connect to analog ground.	I
7	ANALOG_GROUND	Analog Ground	AGND
8	ANALOG_GROUND	Analog Ground	AGND
9	ANALOG_IN_2+	Differential analog positive input	I
10	ANALOG_IN_1+	Differential analog positive input	I
11	ANALOG_IN_2-	Differential analog negative input. For single-ended use, connect to analog ground.	I
12	ANALOG_IN_1-	Differential analog negative input. For single-ended use, connect to analog ground.	I

P2 – Analog Inputs Connector

Pin	Name	Description / Notes	I/O
1	ANALOG_GROUND	Analog Ground	AGND
2	ANALOG_GROUND	Analog Ground	AGND
3	ANALOG_IN_8+	Differential analog positive input	I
4	ANALOG_IN_7+	Differential analog positive input	I
5	ANALOG_IN_8-	Differential analog negative input. For single-ended use, connect to analog ground.	I
6	ANALOG_IN_7-	Differential analog negative input. For single-ended use, connect to analog ground.	I
7	ANALOG_GROUND	Analog Ground	AGND
8	ANALOG_GROUND	Analog Ground	AGND
9	ANALOG_IN_4+	Differential analog positive input	I
10	ANALOG_IN_3+	Differential analog positive input	I
11	ANALOG_IN_4-	Differential analog negative input. For single-ended use, connect to analog ground.	I
12	ANALOG_IN_3-	Differential analog negative input. For single-ended use, connect to analog ground.	I

P3 – Analog Outputs Connector

Pin	Name	Description / Notes	I/O
1	ANALOG_GROUND	Analog Ground	AGND
2	ANALOG_GROUND	Analog Ground	AGND
3	ANALOG_OUT_4-	Differential analog negative output.	O
4	ANALOG_OUT_2-	Differential analog negative output.	O
5	ANALOG_OUT_4+	Differential analog positive output	O
6	ANALOG_OUT_2+	Differential analog positive output	O
7	ANALOG_GROUND	Analog Ground	AGND
8	ANALOG_GROUND	Analog Ground	AGND
9	ANALOG_OUT_3-	Differential analog negative output.	O
10	ANALOG_OUT_1-	Differential analog negative output.	O
11	ANALOG_OUT_3+	Differential analog positive output	O
12	ANALOG_OUT_1+	Differential analog positive output	O

P4 – Analog Outputs Connector

Pin	Name	Description / Notes	I/O
1	ANALOG_GROUND	Analog Ground	AGND
2	ANALOG_GROUND	Analog Ground	AGND
3	ANALOG_OUT_8-	Differential analog negative output.	O
4	ANALOG_OUT_6-	Differential analog negative output.	O
5	ANALOG_OUT_8+	Differential analog positive output	O
6	ANALOG_OUT_6+	Differential analog positive output	O
7	ANALOG_GROUND	Analog Ground	AGND
8	ANALOG_GROUND	Analog Ground	AGND
9	ANALOG_OUT_7-	Differential analog negative output.	O
10	ANALOG_OUT_5-	Differential analog negative output.	O
11	ANALOG_OUT_7+	Differential analog positive output	O
12	ANALOG_OUT_5+	Differential analog positive output	O

P5 – Isolated Digital Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_ISOIN_B	Input common for ISOIN_5…ISOIN_8	-
2	GND_ISOIN_A	Input common for ISOIN_1…ISOIN_4	-
3	ISOIN_8	Isolated digital input	I
4	ISOIN_4	Isolated digital input	I
5	ISOIN_7	Isolated digital input	I
6	ISOIN_3	Isolated digital input	I
7	GND_ISOIN_B	Input common for ISOIN_5…ISOIN_8	-
8	GND_ISOIN_A	Input common for ISOIN_1…ISOIN_4	-
9	ISOIN_6	Isolated digital input	I
10	ISOIN_2	Isolated digital input	I
11	ISOIN_5	Isolated digital input	I
12	ISOIN_1	Isolated digital input	I

P6 – Isolated Digital Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_ISOIN_D	Input common for ISOIN_13…ISOIN_16	-
2	GND_ISOIN_C	Input common for ISOIN_9…ISOIN_12	-
3	ISOIN_16	Isolated digital input	I
4	ISOIN_12	Isolated digital input	I
5	ISOIN_15	Isolated digital input	I
6	ISOIN_11	Isolated digital input	I
7	GND_ISOIN_D	Input common for ISOIN_13…ISOIN_16	-
8	GND_ISOIN_C	Input common for ISOIN_9…ISOIN_12	-
9	ISOIN_14	Isolated digital input	I
10	ISOIN_10	Isolated digital input	I
11	ISOIN_13	Isolated digital input	I
12	ISOIN_9	Isolated digital input	I

P7 – Isolated Digital Outputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_ISOOUT_B	Output common for ISOOUT_5… ISOOUT_8	-
2	GND_ISOOUT_A	Output common for ISOOUT_1… ISOOUT_4	-
3	ISOOUT_8	Isolated digital output	O
4	ISOOUT_4	Isolated digital output	O
5	ISOOUT_7	Isolated digital output	O
6	ISOOUT_3	Isolated digital output	O
7	ISOOUT_B	Output pull-up for ISOOUT_5… ISOOUT_8	-
8	ISOOUT_A	Output pull-up for ISOOUT_1… ISOOUT_4	-
9	ISOOUT_6	Isolated digital output	O
10	ISOOUT_2	Isolated digital output	O
11	ISOOUT_5	Isolated digital output	O
12	ISOOUT_1	Isolated digital output	O

P8 – Isolated Digital Outputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_ISOOUT_D	Output common for ISOOUT_13… ISOOUT_16	-
2	GND_ISOOUT_C	Output common for ISOOUT_9… ISOOUT_12	-
3	ISOOUT_16	Isolated digital output	O
4	ISOOUT_12	Isolated digital output	O
5	ISOOUT_15	Isolated digital output	O
6	ISOOUT_11	Isolated digital output	O
7	ISOOUT_D	Output pull-up for ISOOUT_13… ISOOUT_16	-
8	ISOOUT_C	Output pull-up for ISOOUT_9… ISOOUT_12	-
9	ISOOUT_14	Isolated digital output	O
10	ISOOUT_10	Isolated digital output	O
11	ISOOUT_13	Isolated digital output	O
12	ISOOUT_9	Isolated digital output	O

P9 – Isolated Differential High-Speed Digital Outputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_HSOUT_A	Digital output common for HSOUT_1… HSOUT_4	-
2	GND_HSOUT_A	Digital output common for HSOUT_1… HSOUT_4	-
3	HSOUT_4+	High speed isolated differential positive digital output	O
4	HSOUT_2+	High speed isolated differential positive digital output	O
5	HSOUT_4-	High speed isolated differential negative digital output	O
6	HSOUT_2-	High speed isolated differential negative digital output	O
7	GND_HSOUT_A	Digital output common for HSOUT_1… HSOUT_4	-
8	GND_HSOUT_A	Digital output common for HSOUT_1… HSOUT_4	-
9	HSOUT_3+	High speed isolated differential positive digital output	O
10	HSOUT_1+	High speed isolated differential positive digital output	O
11	HSOUT_3-	High speed isolated differential negative digital output	O
12	HSOUT_1-	High speed isolated differential negative digital output	O

P10 – Isolated Differential High-Speed Digital Outputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_HSOUT_B	Digital output common for HSOUT_5… HSOUT_8	-
2	GND_HSOUT_B	Digital output common for HSOUT_5… HSOUT_8	-
3	HSOUT_8+	High speed isolated differential positive digital output	O
4	HSOUT_6+	High speed isolated differential positive digital output	O
5	HSOUT_8-	High speed isolated differential negative digital output	O
6	HSOUT_6-	High speed isolated differential negative digital output	O
7	GND_HSOUT_B	Digital output common for HSOUT_5… HSOUT_8	-
8	GND_HSOUT_B	Digital output common for HSOUT_5… HSOUT_8	-
9	HSOUT_7+	High speed isolated differential positive digital output	O
10	HSOUT_5+	High speed isolated differential positive digital output	O
11	HSOUT_7-	High speed isolated differential negative digital output	O
12	HSOUT_5-	High speed isolated differential negative digital output	O

P11 – Isolated Differential High-Speed Digital Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GND_HSIN_A	Digital input common for HSIN_1… HSIN_4	-
2	GND_HSIN_A	Digital input common for HSIN_1… HSIN_4	-
3	HSIN_4+	High speed isolated differential positive digital input	I
4	HSIN_2+	High speed isolated differential positive digital input	I
5	HSIN_4-	High speed isolated differential negative digital input (connect to HSIN_A_REF for single-ended use)	I
6	HSIN_2-	High speed isolated differential negative digital input (connect to HSIN_A_REF for single-ended use)	I
7	HSIN_A_REF	Digital input reference voltage for HSIN_1… HSIN_4	-
8	HSIN_A_REF	Digital input reference voltage for HSIN_1… HSIN_4	-
9	HSIN_3+	High speed isolated differential positive digital input	I
10	HSIN_1+	High speed isolated differential positive digital input	I
11	HSIN_3-	High speed isolated differential negative digital input (connect to HSIN_A_REF for single-ended use)	I
12	HSIN_1-	High speed isolated differential negative digital input (connect to HSIN_A_REF for single-ended use)	I

P12 – Encoder Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GROUND	Ground	GND
2	GROUND	Ground	GND
3	ENC_I_1-	Differential encoder 1 index channel negative input (leave open for single-ended encoders)	I
4	ENC_B_1-	Differential encoder 1 B-channel negative input (leave open for single-ended encoders)	I
5	ENC_I_1+	Differential encoder 1 index channel positive input	I
6	ENC_B_1+	Differential encoder 1 B-channel positive input	I
7	GROUND	Ground	GND
8	+5V OUT	+5V encoder supply output; maximum load is 200mA	O
9	NC	No connection	-
10	ENC_A_1-	Differential encoder 1 A-channel negative input (leave open for single-ended encoders)	I
11	NC	No connection	-
12	ENC_A_1+	Differential encoder 1 A-channel positive input	I

Note: If the encoder input stage is configured to support an EnDat 2.2 absolute encoder, pins 12 and 10 become the RS485 bi-directional data channel, and pins 5 and 3 become the differential clock.

P13 – Encoder Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GROUND	Ground	GND
2	GROUND	Ground	GND
3	ENC_I_2-	Differential encoder 2 index channel negative input (leave open for single-ended encoders)	I
4	ENC_B_2-	Differential encoder 2 B-channel negative input (leave open for single-ended encoders)	I
5	ENC_I_2+	Differential encoder 2 index channel positive input	I
6	ENC_B_2+	Differential encoder 2 B-channel positive input	I
7	GROUND	Ground	GND
8	+5V OUT	+5V encoder supply output; maximum load is 200mA	O
9	NC	No connection	-
10	ENC_A_2-	Differential encoder 2 A-channel negative input (leave open for single-ended encoders)	I
11	NC	No connection	-
12	ENC_A_2+	Differential encoder 2 A-channel positive input	I

Note: If the encoder input stage is configured to support an EnDat 2.2 absolute encoder, pins 12 and 10 become the RS485 bi-directional data channel, and pins 5 and 3 become the differential clock.

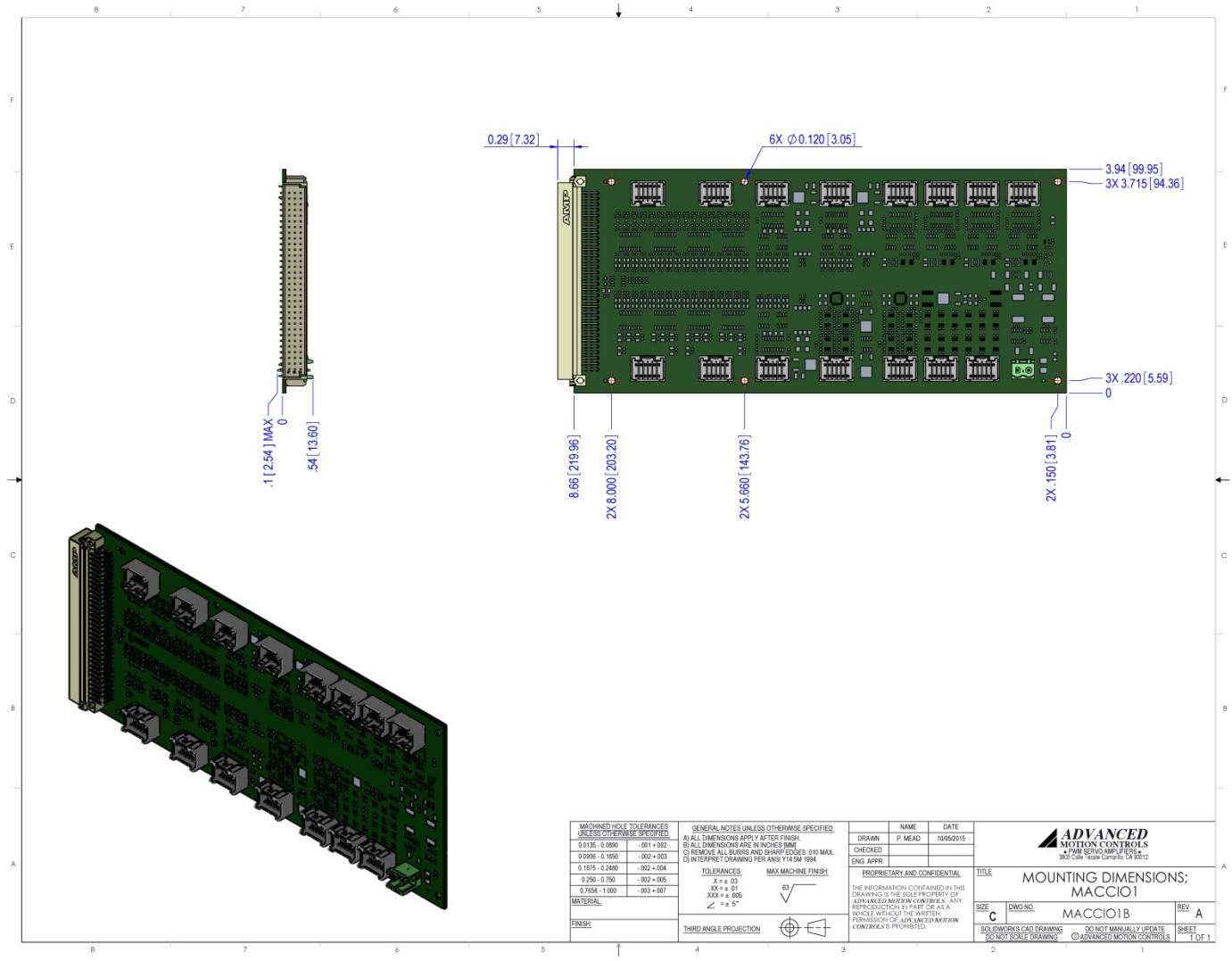
P14 – Encoder Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GROUND	Ground	GND
2	GROUND	Ground	GND
3	ENC_I_3-	Differential encoder 3 index channel negative input (leave open for single-ended encoders)	I
4	ENC_B_3-	Differential encoder 3 B-channel negative input (leave open for single-ended encoders)	I
5	ENC_I_3+	Differential encoder 3 index channel positive input	I
6	ENC_B_3+	Differential encoder 3 B-channel positive input	I
7	GROUND	Ground	GND
8	+5V OUT	+5V encoder supply output; maximum load is 200mA	O
9	NC	No connection	-
10	ENC_A_3-	Differential encoder 3 A-channel negative input (leave open for single-ended encoders)	I
11	NC	No connection	-
12	ENC_A_3+	Differential encoder 3 A-channel positive input	I

Note: If the encoder input stage is configured to support an EnDat 2.2 absolute encoder, pins 12 and 10 become the RS485 bi-directional data channel, and pins 5 and 3 become the differential clock.

P15 – Encoder Inputs Connector			
Pin	Name	Description / Notes	I/O
1	GROUND	Ground	GND
2	GROUND	Ground	GND
3	ENC_I_4-	Differential encoder 4 index channel negative input (leave open for single-ended encoders)	I
4	ENC_B_4-	Differential encoder 4 B-channel negative input (leave open for single-ended encoders)	I
5	ENC_I_4+	Differential encoder 4 index channel positive input	I
6	ENC_B_4+	Differential encoder 4 B-channel positive input	I
7	GROUND	Ground	GND
8	+5V OUT	+5V encoder supply output; maximum load is 200mA	O
9	NC	No connection	-
10	ENC_A_4-	Differential encoder 4 A-channel negative input (leave open for single-ended encoders)	I
11	NC	No connection	-
12	ENC_A_4+	Differential encoder 4 A-channel positive input	I

Note: If the encoder input stage is configured to support an EnDat 2.2 absolute encoder, pins 12 and 10 become the RS485 bi-directional data channel, and pins 5 and 3 become the differential clock.

MOUNTING DIMENSIONS



CUSTOMIZATION INFORMATION

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

Examples of Customized Products

- Optimized Footprint
- Private Label Software
- OEM Specified Connectors
- No Outer Case
- Increased Current Resolution
- Increased Temperature Range
- Custom Control Interface
- Integrated System I/O
- Tailored Project File
- Silkscreen Branding
- Optimized Base Plate
- Increased Current Limits
- Increased Voltage Range
- Conformal Coating
- Multi-Axis Configurations
- Reduced Profile Size and Weight