Central-I Family

CiG1-AMP01-1A-01-00

Hardware User's Manual

Revision control table			
Version	Description	Date	
1.0	Initial (based on Hardware Manual of previous hardware versions)	April 27, 2016	Eyal
1.1	Corrections and additions	April 28, 2016	Gregory
1.11	Rearrange and write the new manual based on the previous hardware manual for AG300	August 10, 2016	YiQing
1.12	Small corrections: Rename Document, removed other product variants from product variant section, file reformatting, corrections to some descriptions CJ	August 11, 2016	CJ
1.13	Added References, Created Product structure section, Created captions for all pictures, descriptions to be added	August 12, 2016	CJ
1.14	Added features of the product and description for each part of this amplifier board	August 14 2016	YiQing
1.15	Added the motor selection criteria for this amplifier	August 17 2016	YiQing
1.16	Change the connector from AMTEK to SAMTEC Updated related pin out	November 15 2016	YiQing
1.17	Adding the bypass STO connection sample	February 25 2017	YiQing

Table of contents

Scope

This manual describes hardware interfaces of the CIG1-AMP01-1A-01-00. [1]

Product description	Part numbers
Amplifier	CIG1-AMP01-1A-01-00

The –XX defines a product's hardware variant, as describes below.

Product structure

CIG1-AMP01-1A-01-XX

The following pictures show the overall structure CIG1-AMP01-1A-01-XX Amplifier, that the XX implies all variant types. All variants of this product type will use the same hardware that can be depicted in Figure 1.

Figure 1: CiG1-AMP1-1A-01-XX Board Overview

System Structure

Overview

The following section will discuss all the hardware functionality that is supported by this product.

Features

This new amplifier board combines the function of controller and driver.

- Precise control with integrated unit
- Support different types of motor with minor hardware

Number of axes

The CIG1-AMP01-1A-01-00 (amplifier board) supports driving of up to 2 motors. This means that the amplifier can drive various kinds of motors.

Supported motor types

The CIG1 amplifier can drive the following motor types:

- 1 DC-Brushless or Bipolar Stepper motor (each motor defined independently).
- Up to 2 DC-Brush, Voice coil motors (each motor defined independently).
- Future firmware will also support, with no hardware change, driving of 2 Brush motors.
- Linear and rotary motors are both supported.

The table below is a sample to show what kind of motor from Akribis can be used on such a certain kind of amplifier. The criteria are to compare the peak and continuous current of the motor and the amplifier. If the continuous current and peak current is within the range of the amplifier board, it means such a kind of motor can be supported by the CIGI amplifier.

No #	Amplifier Type	Motor type
CIGI-AMP01-1A-01-02		AUM1 S1-S4; AUM2 S1-S4, S8; AUM3-S1...
		ACM1-S30, S50, S80, S100...
CIGI-AMP01-1A-01-03		AUM1 S1-S2; AUM2 S1 (Series)...
		AVM12-6.4; AVM19-5; AVM20-10; DGV16; XRV76...

No #	Amplifier Type	Motor type
	CIGI-AMP01-1A-01-04	AVM20-10; AVM24-5; AVM24-10…

Note: This amplifier can provide a stable bus voltage from 12v to 90v which is an important factor for motor sizing.

Products' variants

The –XX at the end of the product's part number (see label on the product) defines the product's variant. This product belongs to a subset of families from the Central-I range. It is meant to act as a slave unit to the CIG1-MAS controller variants communicating via the Central-I protocol. Detailed information regarding the part numbering for Central-I products see [1]

For the amplifier:

CIG1-AMP01-1A-01-02: Full variant for 20A Full Scale.
All hardware interfaces are assembled and included.
Up to 16A peak current.
Up to 8A continuous current.

CIG1-AMP01-1A-01-03: Full variant for 10A Full Scale.
All hardware interfaces are assembled and included.
Up to 8A peak current.
Up to 4A continuous current.

CIG1-AMP01-1A-01-04: Full variant for 5A Full Scale.
All hardware interfaces are assembled and included.
Up to 4A peak current.
Up to 2A continuous current

Power Connection

General

The following section will discuss the power connection of DC amplifier.
When use the CIG1-AMP01 to drive the motor, user should provide the module two parts of power which is described in the following part. Meanwhile, user should carefully follow the suggestion and detailed notes in the following sections to ensure the safety and correct use of the CIG1-AMP01.

Power Supplies and Connection

The power of the CIG1-AMP01 is combined by two parts of power:

- Logic 9V~36VDC power supply for both the logic signals and Isolated IO Power

  Recommended Logic Power Supply Type: Meanwell S-100-24 Power Supply

- Unit Power 12V~90VDC for motor driving.

  Recommended Logic Power Supply Type: Meanwell T-60C Power Supply

- It is always recommended to use a single “Ground Potential Point” for all supplies in the system.

The CIG1-AMP01 provides isolated IOs, differential IOs and static brakes electrical interfaces. If these functions are required by the application, external power supply can be used.

Wire and Cable selection

This section will describe rules in detail for choosing the cables and wires used in the CIG1-AMP01 to ensure the high performance and low EMI of the whole system.

- Use twisted pair shielded wires for the control, feedback and communication
- The impedance of the wires must be as low as possible. The selection of the wires should on the basis of the current consumption. Usually, the size of the wires should be thicker than the real application current. Generally, a 24AWG wire is recommended to be used for the logic, analog control and feedback signals.
- Always use shielded cables for motor connection
- Keep motor cable as far as possible from the control, feedback and communication lines and cables
- Keep all wires and cables as short as possible
- Generally, under normal operating conditions, cables with shield should not carry any current. If not, this may damage the controller and even the whole system.

AMPLIFIER – CIG1-AMP01-1A-01-00

This document provides a detailed description of the interface of the amplifier.

Logic power connector

This chapter describes the amplifier's logic power connector.

Amplifier – J1 – Logic Power

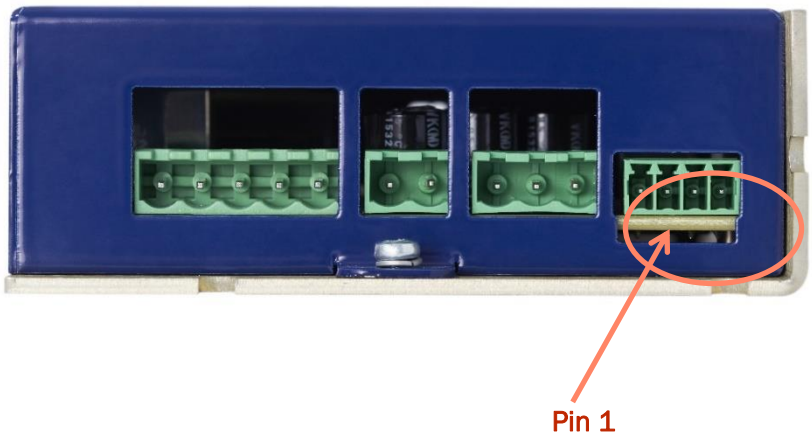


Figure 2 Logic Power Port

Description: The graph above is about the logic power port on the amplifier board.
Manufacturer: DEGSON (Phoenix compatible)
P/N (product side): 15EDGRC3.504P1400AH
Pitch: 3.5mm
Mating Type: MC 1,5/4-ST-3,5

Pin #	Name	Type	Description
1	Isolated IO Power	PWR - IN	9V~36VDC
2	Isolated IO Power Return	PWR -IN	IO Power Return
3	Backup/Logic Power	PWR -IN	9VDC-36VDC
4	GND	PWR -IN	Logic power ground

Amplifier board connectors

The chapter describes the connectors and interfaces of the amplifier board.

Amplifier – J2 – Unit power

J2 is used to supply power to the overall unit. The input voltage is directly connected to the amplifier power bridge to drive the motors, and in parallel it is used to generate internal logic power in order to power the amplifier.

Note – Optional schemes for isolated power supplies:

The amplifier is designed to support fully isolated power supplies, one for the power circuitry (ie. Amplifiers) to drive the motors and one for the digital logic. Such operation requires a dedicated hardware variant. Please consult the designer in case you would like to consider this scheme.

The amplifier includes a protection to avoid damage in case of inversed polarity at the input power.

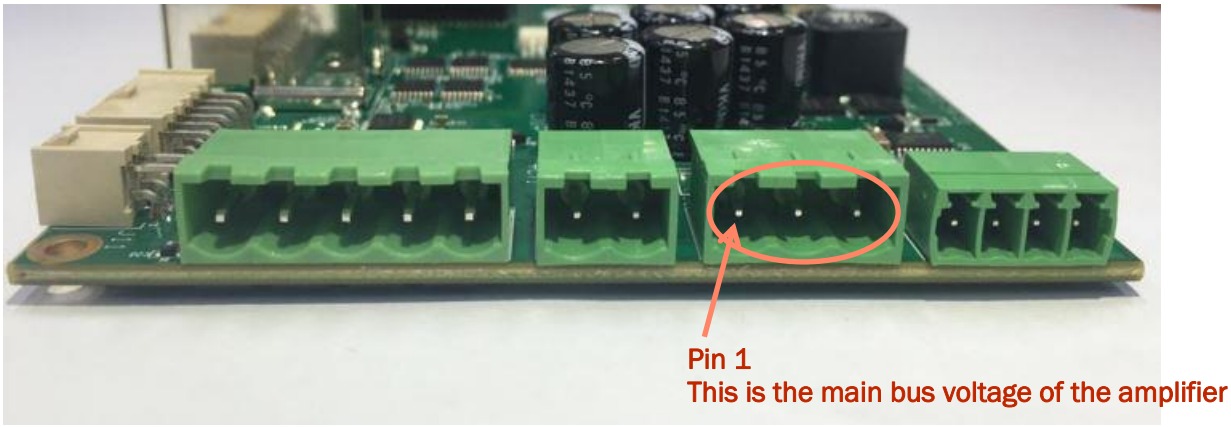


Figure 3 Unit Power Port

Description: The graph above is about the unit power port on the amplifier board.
Manufacturer: DEGSON (Phoenix compatible)
P/N (product side): 2EDGRC5.0803P14H
Pitch: 5.08mm
Mating Type: MSTB 2,5/ 3-ST-5,08

Pin #	Name	Type	Description
1	Main Power	PWR - IN	Motor power input: 12V to 90V, up to 8A continuous
2	Power GND	PWR -IN	Power GND
3	GND-EARTH	PWR	Earth ground connection

Filter Capacitors are also connected with the main power to provide stable power supply for the I/O ports and two encoders.

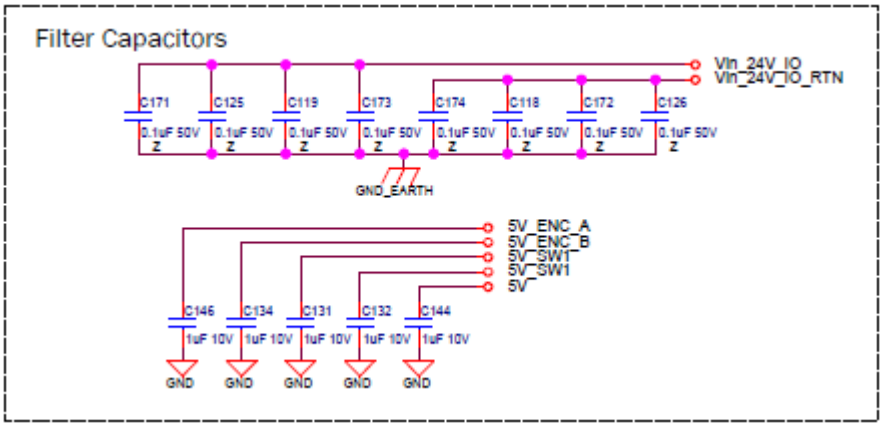


Figure 4 Filter Capacitor

Amplifier – J3 - Regeneration

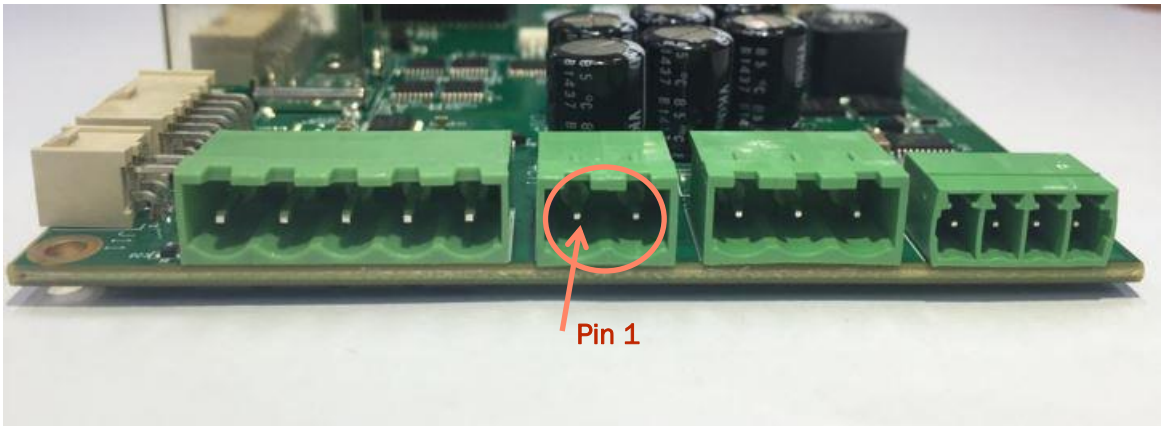


Figure 5 Regeneration Port

Description: The graph above is about the regeneration port on the amplifier board.
Manufacturer: DEGSON (Phoenix compatible)
P/N (product side): 2EDGRC5.0802P14H
Pitch: 5.08mm
Mating Type: MSTB 2,5/2-ST-5,08

Pin #	Name	Type	Description
1	Internal DC Bus	PWR –OUT	The internal DC Bus power (the same as the main power supply, see J2, but after the circuit of inversed polarity protection).
2	Regeneration	PWR	Regeneration pin to be connected to an external regeneration resistor. Limited to 16A. The external regeneration resistor should be connected between this pin (pin 2) and the Internal DC Bus pin (pin 1).

Note –Regeneration function is currently not supported:

The Central I controller firmware does not support the operation of the regeneration function yet. This feature will be added soon, without any hardware change.

Electrical interfaces - Regeneration:

The circuitry involved in regeneration is depicted in the schematic bel

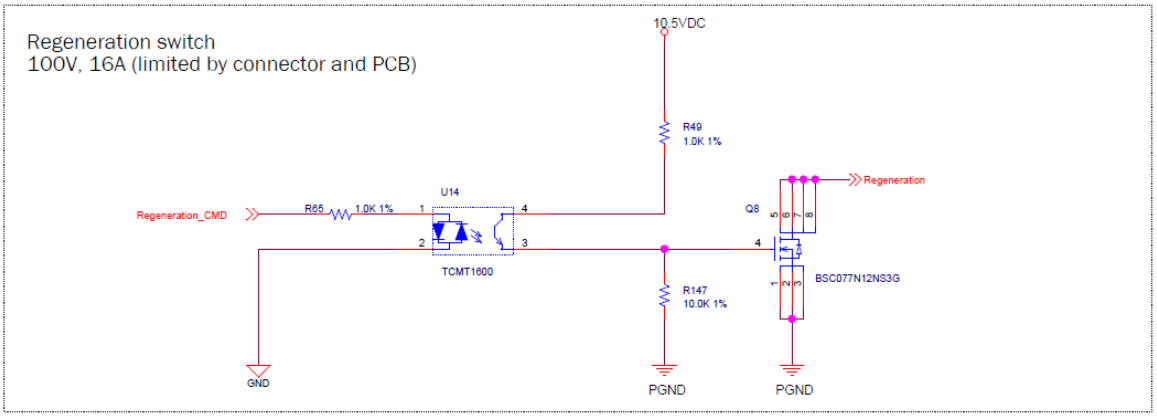


Figure 6 Regeneration circuit diagram

Amplifier – J4 – Motor Phases

J4 is used to connect to the motors' phases. Connection depends on the motor type, as described below.

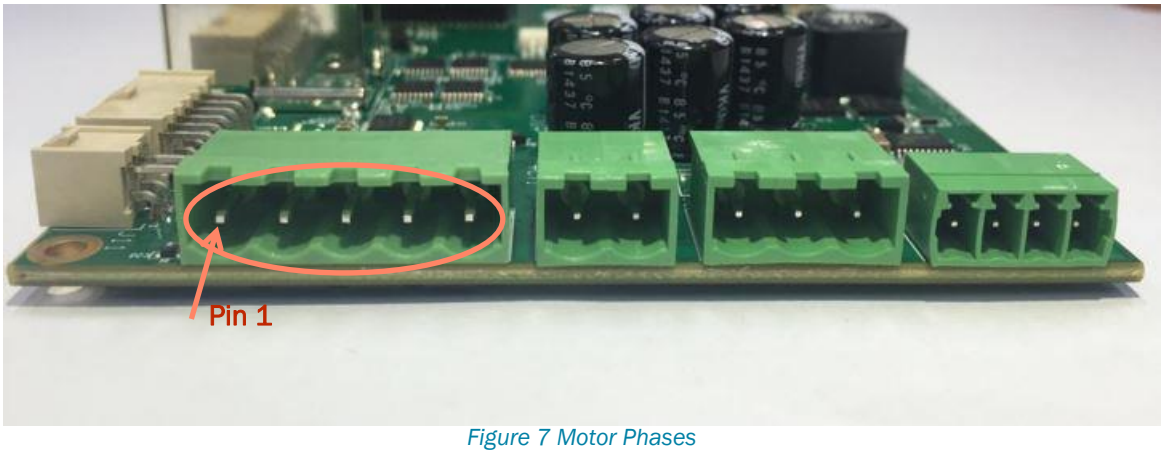


Figure 7 Motor Phases

Description: The graph above is about the motor phases port on the amplifier board.
Manufacturer: DEGSON (Phoenix compatible)
P/N (product side): 2EDGRC-5.08-05P-14-00AH
Pitch: 5.08mm
Mating Type: MSTB 2,5/5-ST-5,08

For one Brushless motor:

Pin #	Name	Type	Description
1	Motor A Phase A	PWR -OUT	
2	Motor A Phase B	PWR -OUT	
3	Motor A Phase C	PWR -OUT	
4	NA		Unused
5	GND_EARTH	PWR -OUT	Earth ground connection

For two Brush (or voice coil) motors:

Pin #	Name	Type	Description
1	Motor A Phase 1+	PWR -OUT	
2	Motor A Phase 1-	PWR -OUT	
3	Motor 2 Phase 2+	PWR -OUT	
4	Motor 2 Phase 2-	PWR -OUT	

5	GND_EARTH	PWR -OUT	Earth-ground connection

For one stepper motor:

Pin #	Name	Type	Description
1	Motor A Phase 1 +	PWR -OUT	
2	Motor A Phase 2 +	PWR -OUT	
3	Motor A Phases 1- and 2 -	PWR -OUT	Two motor wires are connected to a single pin of the connector
4	NA		Unused
5	GND_EARTH	PWR -OUT	Earth-ground connection

Note – Stepper voltage range:

Note that a bipolar stepper motor has two independent phases (total of 4 wires). With the CIG1-AMP01, you need to connect the (-) wire of both phases together, into the third pin of the connector (for motor A).

This connection implies a limitation of the voltage that will be applied to the stepper. For example, if the power supply to the unit is 24v, each phase of the stepper motor will be limited to 12v.

With suitable selection of the power supply this should impose no limitation on the stepper motor operation.

User may connect different types of motors to motor A and to motor B. Just follow the above instructions for each motor, independently.

Amplifier – J5 – STO

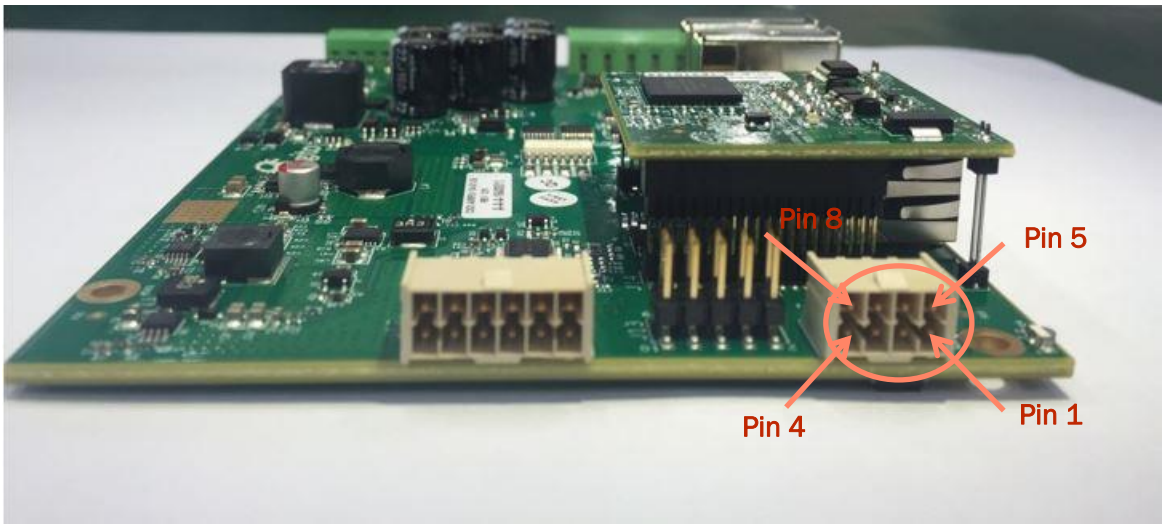


Figure 8 STO Port

Description: The graph above is about the STO port on the amplifier board.
Manufacturer: Samtec Inc
P/N (product side): IPL1-104-01-L-D-RA-K
Cable connector P/N: IPD1-04-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	5V	PWR - OUT	5V or 24V supply for STO circuits
2	STOFB-	OUT	Safe Torque Off 1 negative (emitter) output
3	STO2-	IN	Safe Torque Off 2 negative input
4	STO1-	IN	Safe Torque Off 1 negative input
5	GND	PWR -OUT	GND
6	STOFB+	OUT	Safe Torque Off 1 positive (collector) output
7	STO2+	IN	Safe Torque Off 2 positive input
8	STO1+	IN	Safe Torque Off 1 negative input

Notes – STO Implementation:

- STO1 and STO2 are completely independent. Each one of them disables the power to the motor in a different way.
- Both STO1 and STO2 disable the power to the motor by hardware circuitry, without any software intervention.
- The circuitry, logic and redundancy of the STO implementation were done according to safety standards. Yet, the design is to be tested and formally approved for the industry standard.
- The STO1 and STO2 are defined with a positive pin (+) and a negative pin (-). However (refer to the electrical interfaces described below) the opto coupler at the STO input (as for all other discrete, isolated inputs of the amplifier) is equipped with two input diodes, enabling operation at "positive" or "negative" input voltage. The input is actually activated by (enough) current at one of the input diodes, independently of the current direct. This enables NPN or PNP connection to the STO inputs (each one of them independently!).
- The STO protection logic is designed such that the STO inputs (both of them) must be powered in order to enable motor operation. Leaving an STO input disconnected will prevent motor operation. This logic is required in order to ensure that a disconnected safety cable will be considered by the control unit as an unsafe situation. When (enough) current is driven through an STO input, the state of this input is "safe". When no (not enough) current is driven through an STO input, the state of this input is "unsafe".
- The two STO inputs must be at "safe" state in order to enable motor operation.
- Both STO1 and STO2, although acting on the drive hardware directly, are also sensed by the controller software. The controller software is generating a feedback signal to the user (STO_FB) which is also an isolated signal. This feedback is generated by the software and is activated in case a least one of STO1 or STO2 signals unsafe situation.

Electrical interfaces – STO:

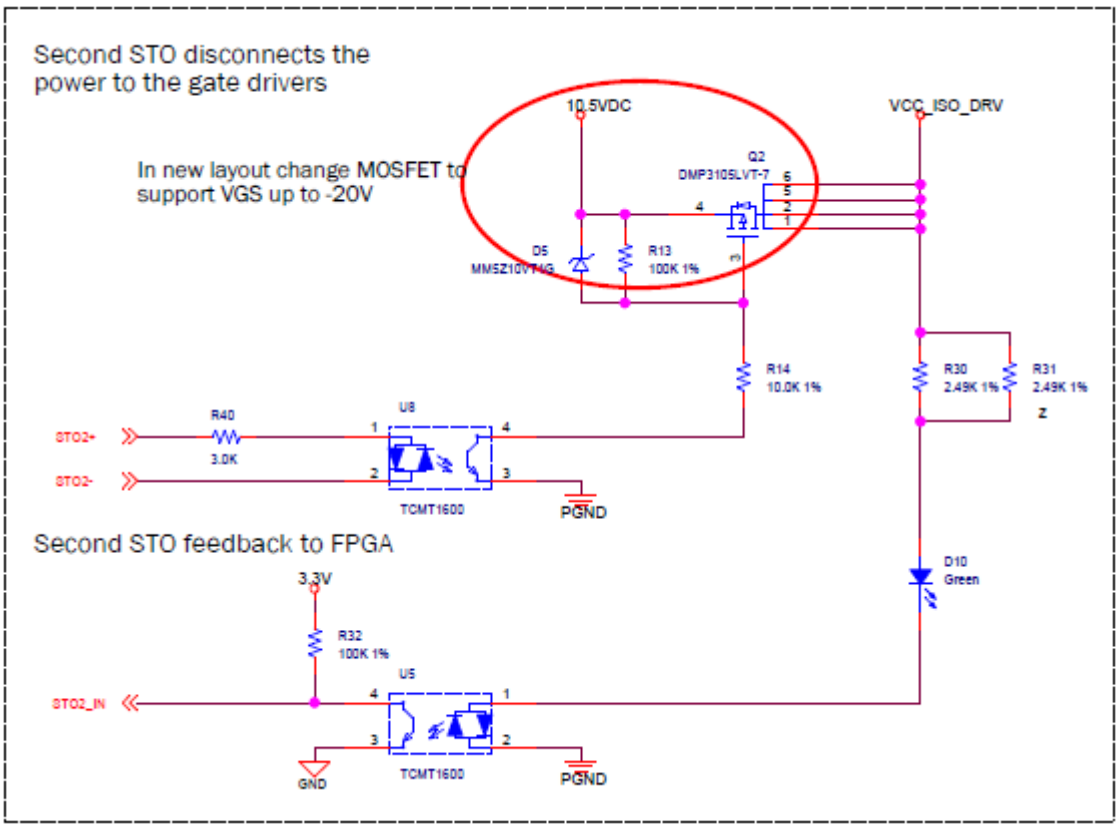


Figure 9 STO Circuit Diagram

- The electrical characteristics of the STO1 and STO2 inputs are identical to those of the discrete, isolated inputs of the controller. Refer to the chapter about J10 below.

Notes –The connection of bypassing STO:

- Connect the pin 1, pin7 and pin8 together and connect the pin 5 ,pin3 and pin4 together.

Pin #	UPPER	LOWER
	5	1
	6	2
	7	3
	8	4

Amplifier – J8/J9– Encoders

J8 and J9 are identical connectors. Each one is used to interface a single encoder, where J8 is typically used for A axis, J9 is typically used for B axis.

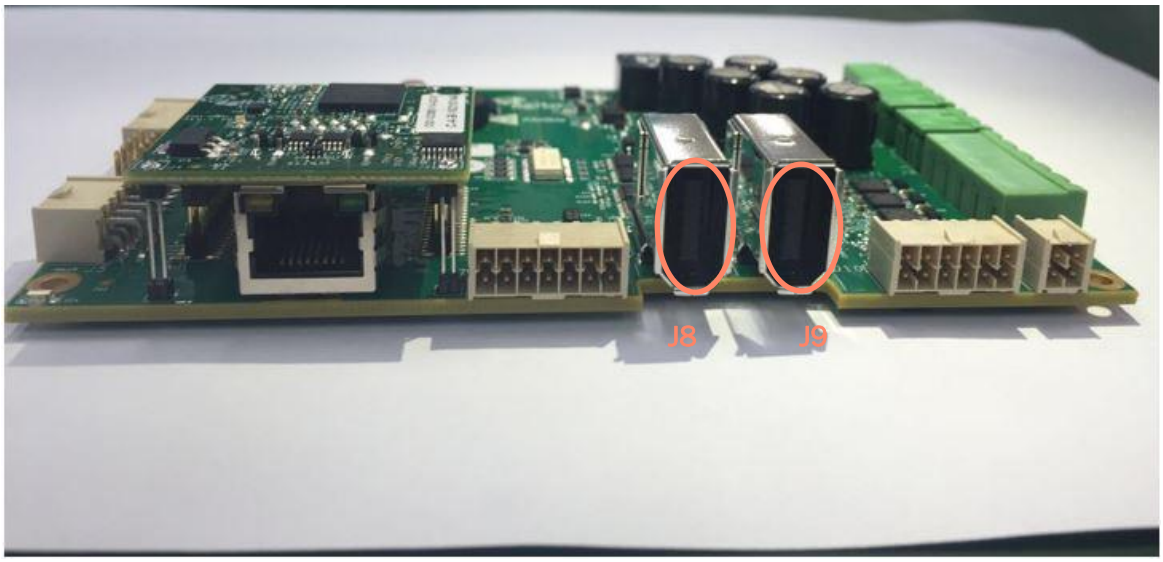


Figure 10 Encoder Ports

Description: The graph above is about the encoder port on the amplifier board.
Manufacturer: SUNCHU.
P/N (product side): SC-MCR10S90A4G
Cable connector P/N: SC-10-4P
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	5V	PWR - OUT	5V for user usage (up to 0.5A, each connector)
2	GND	PWR -OUT	Reference for 5V and differential signals
3	Encoder_1P	Out	Differential output, not inverted
4	Encoder_1N	Out	Differential output, inverted
5	Encoder_2P	In	Differential input, not inverted
6	Encoder_2N	In	Differential input, inverted
7	Encoder_3P	In	Differential input, not inverted
8	Encoder_3N	In	Differential input, inverted
9	Encoder_4P	Bidirectional	Differential input/output, not inverted
10	Encoder_4N	Bidirectional	Differential input/output, inverted

Several encoder options are available. For each type of encoder, the inputs and outputs are selected according to the table below:

Differential line	Incremental	Sin/Cos	SSI	BiSS	Nikon	Tamagawa	Panasonic
Encoder_1				OUT			
Encoder_2	IN- A	IN-SIN					
Encoder_3	IN- B	IN-COS	IN	IN			IN
Encoder_4	IN- Z	IN-Z	OUT	OUT	INOUT	INOUT	OUT

Notes – Supported encoder types and connection of incremental encoder:

Currently only incremental encoder type is supported. SIN/COS analog encoders (and SSI, BiSS, Nikon, Tamagawa, and Panasonic encoders) will soon be supported as well, to be followed also with absolute encoders support.

Note (see table above) that the A. B and Z channels of the encoder are connected to Encoder_2, Encoder_3 and Encoder_4 pins of the connector, respectively.

Note – Incremental encoder interface details:

The internal design of the A, B and Z signals interfaces supports, by default, differential inputs. However, with a dedicated assembly, it can support, without any external component, also single ended encoders. Please consult the designer in case your application uses single ended encoders or any other special, non-differential interface.

The default differential encoder's interface includes a built-in 120 ohms terminator (per each channel) and also the required hardware circuits to detect disconnected encoder cable (and in such case, the controller will disable the motor). The detection is done on the A and B channels only (and not on the index, Z, channel)

Note: 5v supply limitation:

Note that the 5v supply that is provided at pin 1 of each of the J8 and J9 connectors is internally limited to 0.5A per each connector (independent limitation at each connector). This is in order to protect the controller from short to GND.

Future firmware versions of the controller will be able to detect and report such fault and to disable the 5v supply until the fault is fixed. Currently, the current will be limited, but the detection of this limit and the shutting off of the 5v supply is not supported yet.

Physical Pin Layout – Encoder:

Pin #	Left Column	Right Columm
	1 *	2
	3	4
	5	6
	7	8
	9	10

- The maximum current for each connector is 0.5A.

Amplifier – J10/J12 – I/O Ports

This section describes the details of three I/O Ports J10 and J12.

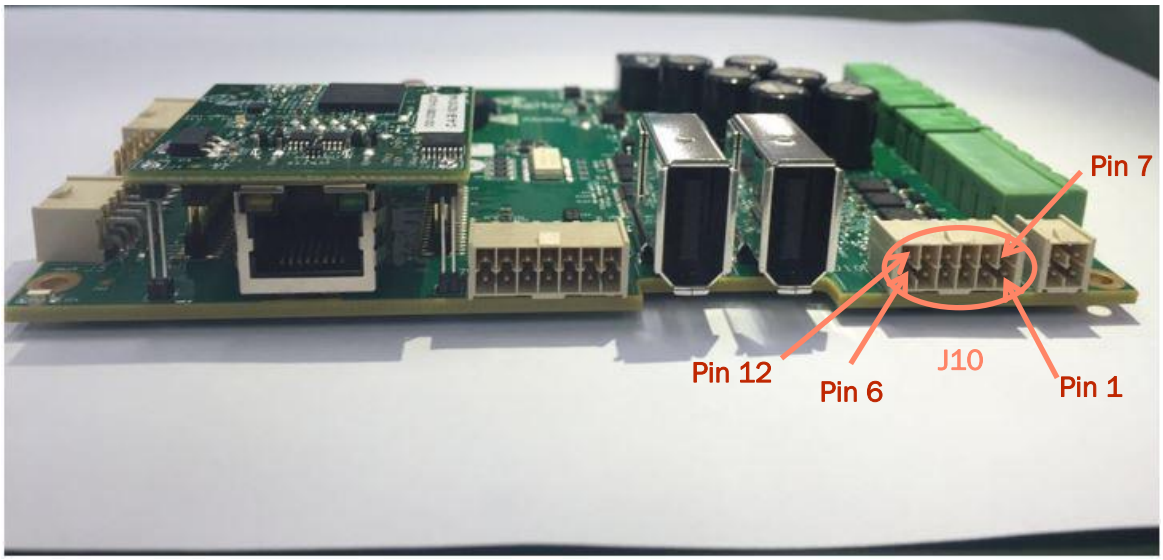


Figure 11 I/O Port 1

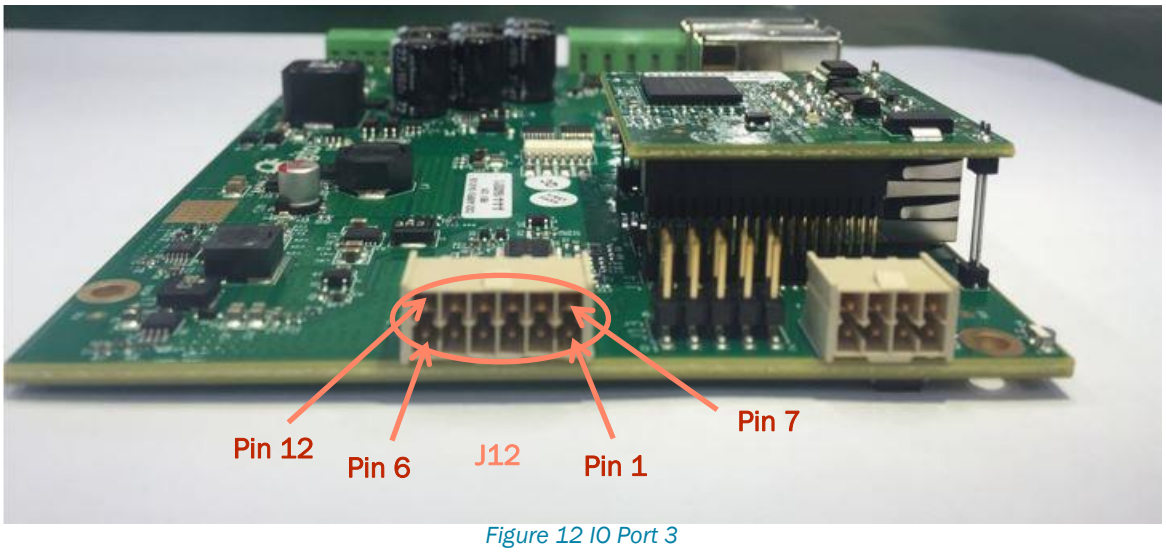


Figure 12 IO Port 3

Description: The graphs above are about the two IO ports on the amplifier board.

Manufacturer:	Samtec Inc
P/N (product side):	IPL1-106-01-L-D-RA-K
Cable connector P/N:	IPD1-06-D-K
Crimp P/N:	CC79L-2630-01-L
	Other options are possible; please, consult with the manufacturer.

Pinout for J10 (I/O Port 1) is described below.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR -OUT	IO Power Return
2	Vin_24V_IO	PWR -OUT	24V IO Power
3	OC_Input4	IN	Discrete, isolated, input 4 (NPN or PNP, depending on connection of the common pin of this group)
4	OC_Input2	IN	Discrete, isolated, input 2 (NPN or PNP, depending on connection of the common pin of this group)
5	OC_INPUT_1234_Common	IN	Common power pin for discrete, isolated, inputs 1 to 4
6	Analog _Input1	IN	Analog input 1, ±12v, 12 bit
7	GND_EARTH	PWR	Ground-earth connection
8	GND	PWR -OUT	Ground
9	5V_SW1	PWR -OUT	5V Power Supply for other components
10	OC_Input3	IN	Discrete, isolated, input 3 (NPN or PNP, depending on connection of the common pin of this group)
11	OC_Input1	IN	Discrete, isolated, input 1 (NPN or PNP, depending on connection of the common pin of this group)
12	Analog_Input_Return_1	IN	Analog input 1 return (internally connected to GND)

Pinout for J12 (I/O Port 3) is described below.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR -OUT	IO Power Return
2	Vin_24V_IO	PWR -OUT	24V IO Power
3	OC_Input11	IN	Discrete, isolated, input 11 (NPN or PNP, depending on connection of the common pin of this group)
4	OC_Input9	IN	Discrete, isolated, input 9 (NPN or PNP, depending on connection of the common pin of this group)
5	OC_INPUT_891011_Common	IN	Common power pin for discrete, isolated, inputs 1 to 4
6	Analog _Input2	IN	Analog input 2, ±12v, 12 bit
7	GND_EARTH	PWR	Ground-earth connection
8	GND	PWR -OUT	Ground
9	5V_SW2	PWR -OUT	5V Power Supply for other components
10	OC_Input10	IN	Discrete, isolated, input 10 (NPN or PNP, depending on connection of the common pin of this group)
11	OC_Input8	IN	Discrete, isolated, input 8 (NPN or PNP, depending on connection of the common pin of this group)
12	Analog_Input_Return_2	IN	Analog input 2 return (internally connected to GND)

Note – Analog outputs are not supported in some of the product variants:

Some variants of the product do not support the analog outputs. Please consult the designer for ordering the correct variant in case you need analog outputs for your application.

Analog outputs are required in case you need to interface external amplifier over a ±10v analog command, or in case you need analog output for any other general purpose.

Note: 5v supply limitation:

Note that the 5v supply that is provided on both pin 9 in Port J10 and J12 is internally limited to 0.5A (both pins together). This is in order to protect the amplifier from short to GND.

Future firmware version of the amplifier will be able to detect and report this fault and to disable the 5v supply until the fault is fixed. Currently, the current will be limited, but the detection of this limit and the shutting off of the 5v supply is not supported yet.

Electrical interfaces – Discrete, Isolated, inputs:

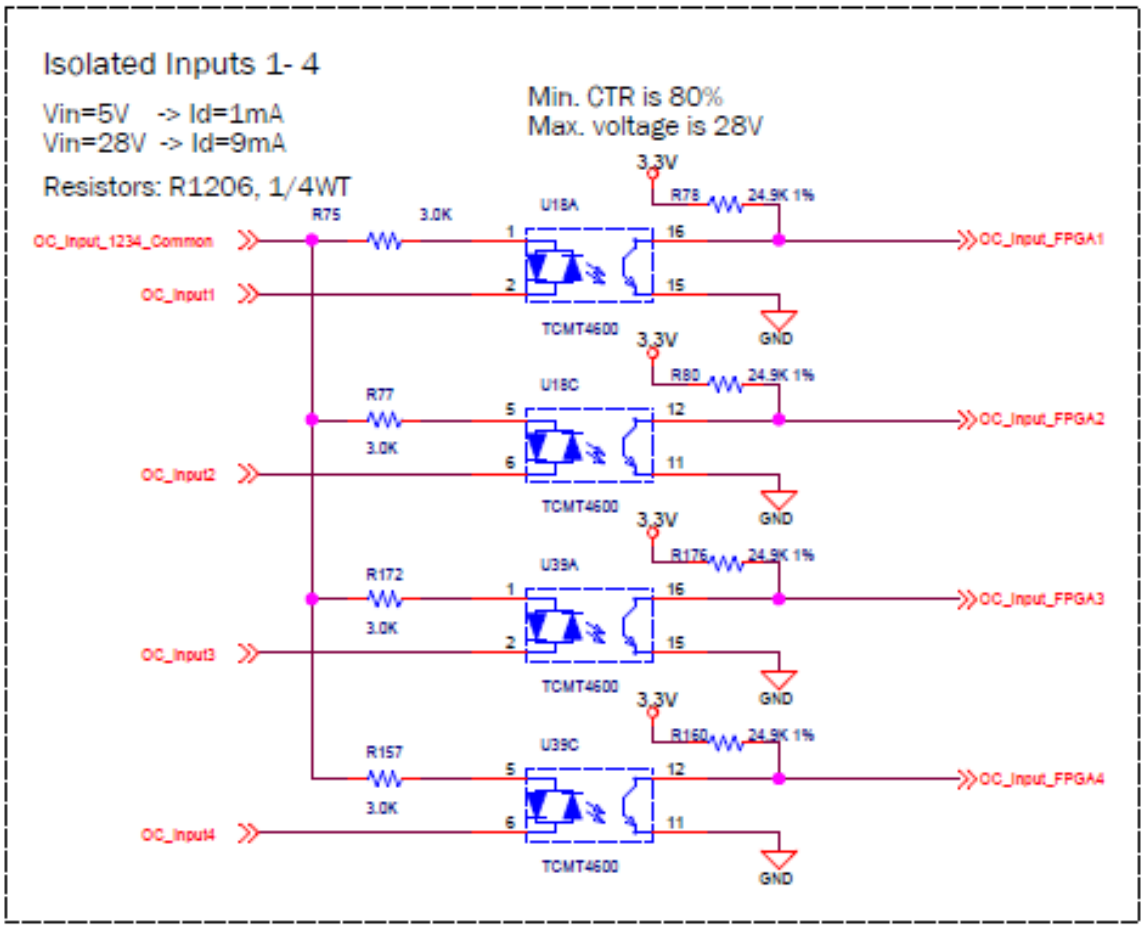


Figure 13

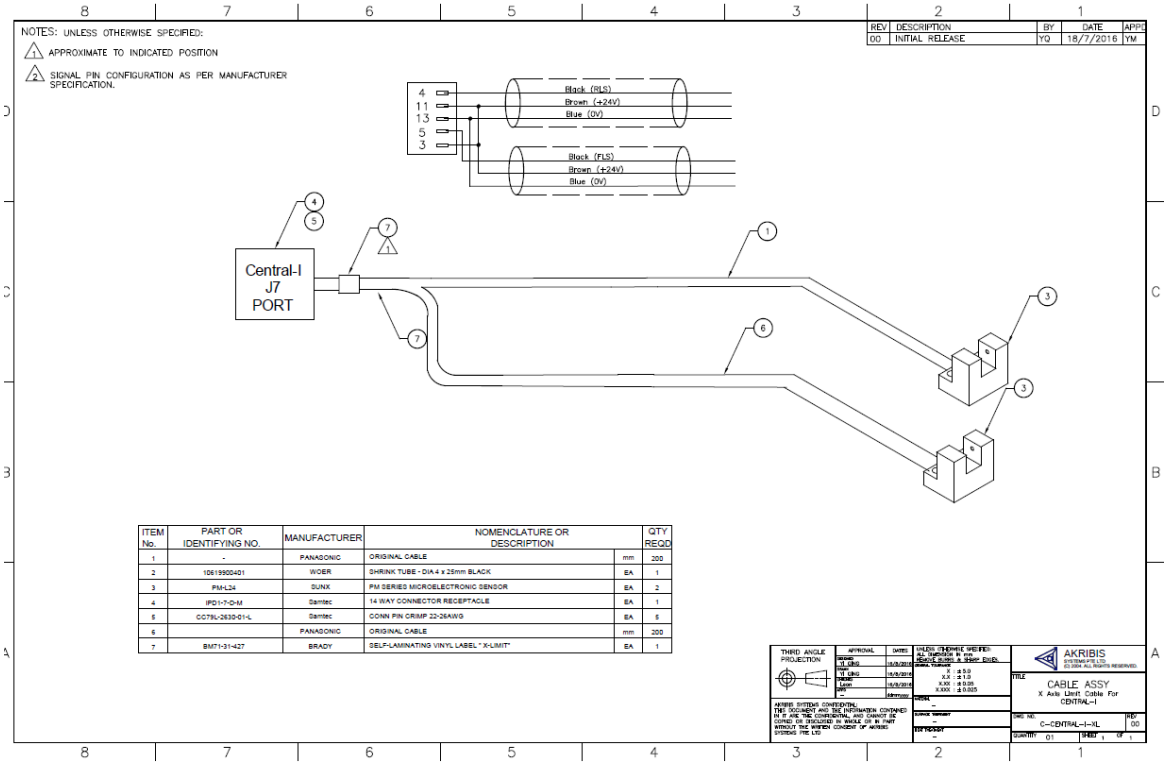
- The interface circuit is identical for inputs 1 to 4, which are organized as a single group.
- Similarly, in Port J7, inputs 5-7 are organized as a group with an identical interface circuits and in Port J12, inputs 8-11 are a third independent group. Each group is fully isolated and independent of the other groups.
- Each group can be connected as NPN or PNP interfaces, depending on the wiring of the group common pin. If the common pin is connected to power (5v to 28v), then the

inputs of this group can be used with external NPN devices (external current sinking devices). If the common is connected to the GND of some external power, then the inputs can be used with external PNP devices (external current sourcing devices).

- Note that the input circuit of the opto couplers includes two diodes. This enables the usage as NPN of PNP.
- Clearly, one group can be wired to interface external NPN devices and another group can be wired to interface PNP devices. However, within a group, all interfaces should be the same, as they are based on the connection of the group common pin

Sample – Connection for Digital IO

Here we take the connection of limit switches to digital input as example



Electrical interfaces – Analog inputs:

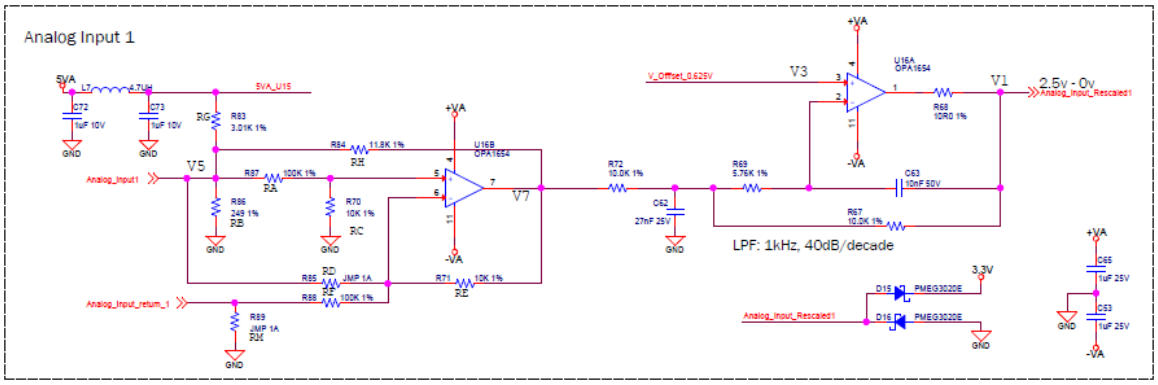


Figure 14

INPUT	VIN=-12V till +12V (Differencial)	VIN=-12V till +12V (Single Ended)	(4-20)mA (Single Ended)	FORCE SENSOR	PT100 SENSOR
RA	100 kOHm 1%	86.6 kOHm 1%	38.3 kOHm 1%	NC	11.0K 1%
RB	NC	NC	249R	NC	NC
RC	10 kOHm 1%	10kOHm 1%	10 kOHm 1%	0 OHm	NC
RD	NC	NC	NC	0 OHm	NC
RE	10 kOHm 1%	0 OHm	0 OHm	RFSR-min + 20% (*) (MAX. FORCE)	105K 1%
RF	100 kOHm 1%	NC	NC	NC	0 OHm
RG	NC	NC	NC	NC	3.01K 1%
RH	NC	NC	NC	NC	11.8K 1%
RM	NC	NC	NC	NC	12.4K 1%
	Default State				

Figure 15

- The electrical interfaces of analog input 2 is identical to those of analog input 1.
- The analog inputs are -12v to +12v, 12 bits.
- Input circuit drawing is quite complex, in order to optionally support variety of analog input sources. However, default assembly (see black mark) is for standard differential analog input, with a simple input circuit, having an input resistance of ~60K ohms.
- Input circuit bandwidth: 1KHz, -40 dB/dec.
- For dedicated (non-differential) analog input formats, as shown in the above table, or for any other type, please consult designer for dedicated hardware variants of the product.
- The software provides parameters to control the analog input reading, as follows:
  - Filter.
  - Offset.

- Dead band.
- Gain.

Amplifier – J7– I/O Port

This section describes the details of three I/O Ports J10 and J12.

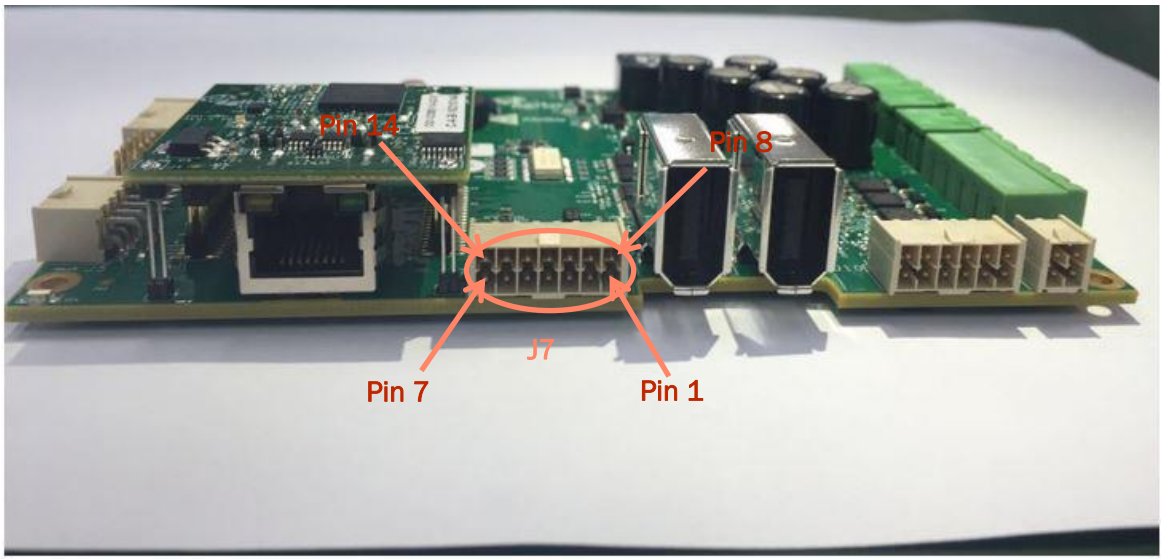


Figure 16 I/O Port 2

Description: The graph above is about the second IO port on the amplifier board.
Manufacturer: Samtec Inc
P/N (product side): IPL1-107-01-L-D-RA-K
Cable connector P/N: IPD1-07-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pinout for J7 (I/O Port 2) is described below.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR -OUT	IO Power Return
2	Vin_24V_IO	PWR -OUT	24V IO Power
3	OC_Output1	OUT	Discrete, isolated, output 1 (programmable sink or source)
4	OC_Output_123_Common_Power	PWR - IN	Common power pin for discrete, isolated, outputs 1 to 3
5	OC_Input6	IN	Discrete, isolated, input 6 (NPN or PNP, depending on connection of the common pin of this group)
6	OC_INPUT_567_Common	IN	Common power pin for discrete, isolated, inputs 5 to 7

Pin #	Name	Type	Description
7	DIF_IO_P	IN	Differential IO positive input (Also support single ended)
8	GND_EARTH	PWR	Ground-earth connection
9	OC-Output3	OUT	Discrete, isolated, output 3 (programmable sink or source
10	OC-Output2	OUT	Discrete, isolated, output 2 (programmable sink or source)
11	OC_Output_123_Common_Return	PWR - IN	Common power return pin for discrete, isolated, outputs 1 to 3
12	OC_Input7	IN	Discrete, isolated, input 7 (NPN or PNP, depending on connection of the common pin of this group)
13	OC_Input5	IN	Discrete, isolated, input 5 (NPN or PNP, depending on connection of the common pin of this group)
14	DIF_IO_N	IN	Differential IO negative input (Also support single ended)

Electrical interfaces – Discrete, Isolated, outputs:

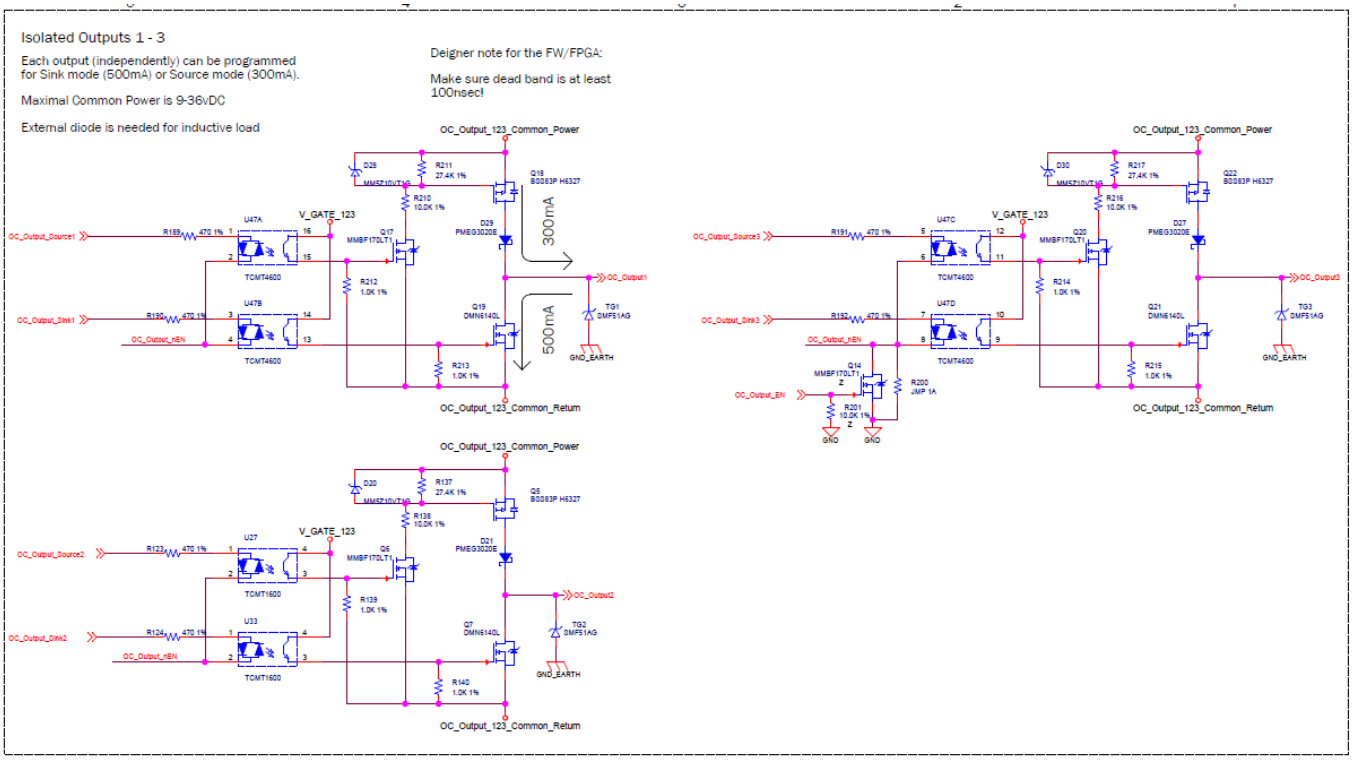


Figure 17

- The interface circuit is identical for outputs 1 to 3.
- Each output can be programmed (by a software parameter) to act as a current sourcing output (up to 300mA) or as a current sinking output (up to 500mA).
- Common power is shared by all 3 outputs.
- Common power can go up to 45 volts. Yet, typical usage should be limited by 36v.

Amplifier – J11 - Static brakes

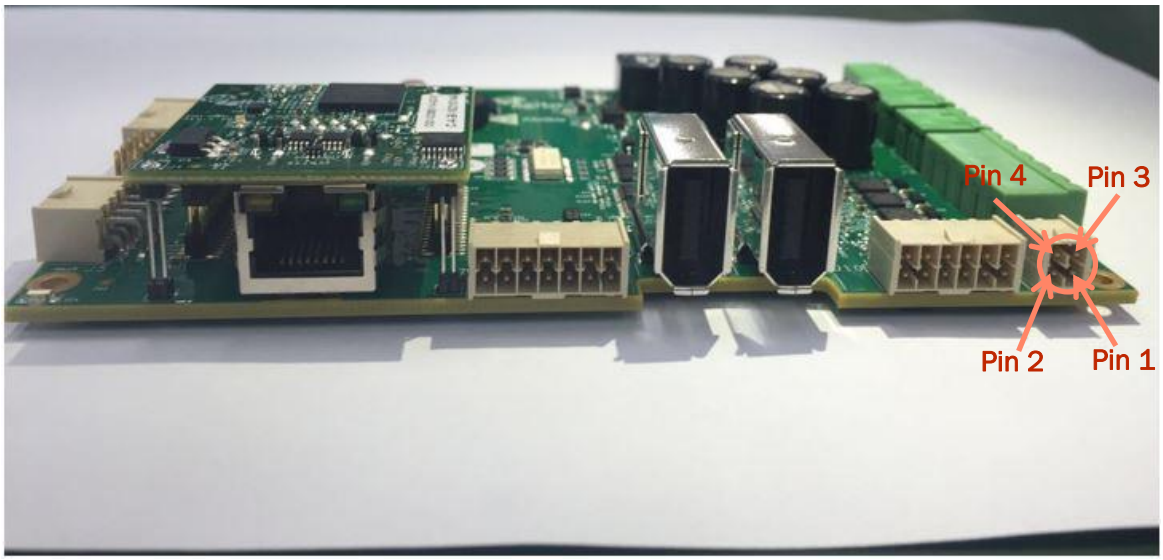


Figure 18

Description: The graph above is about the static brakes port on the amplifier board.
Manufacturer: Samtec Inc
P/N (product side): IPL1-102-01-L-D-RA-K
Cable connector P/N: IPD1-02-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Static_Brake_High	PWR	Static brake output for motor . Open-drain output with built-in flyback diode to the Brake_Power for direct connection into inductive load. Up to 3A operation.
2	Brake_Power	PWR – IN	Power supply for the brake isolated circuits in the controller. Up to 48vDC.
3	Brake_Power_RTN	PWR	Return pin for the Brake_Power.
4	NC (Not Connected)	NC	This pin is unused

Note – Static Brake not supported yet:

The Central-I controller firmware does not support the operation of the static brake outputs yet. This feature will be added soon, without any hardware change.

Electrical interfaces – static brakes:

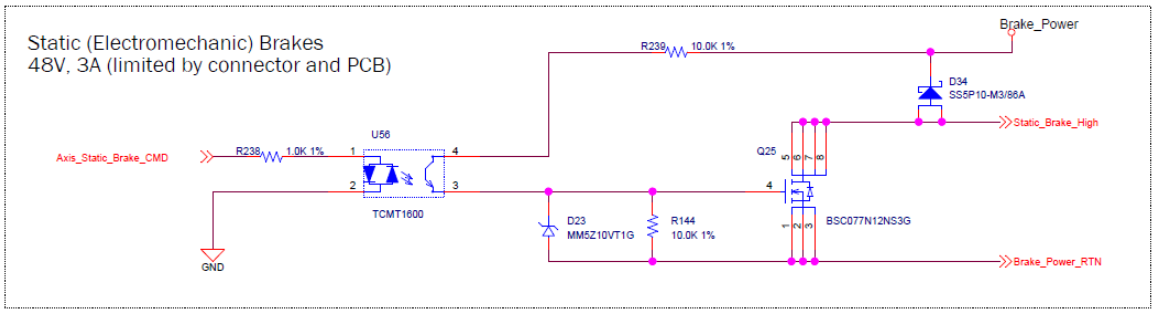


Figure 19 Circuit Diagram

Amplifier– Communication Port

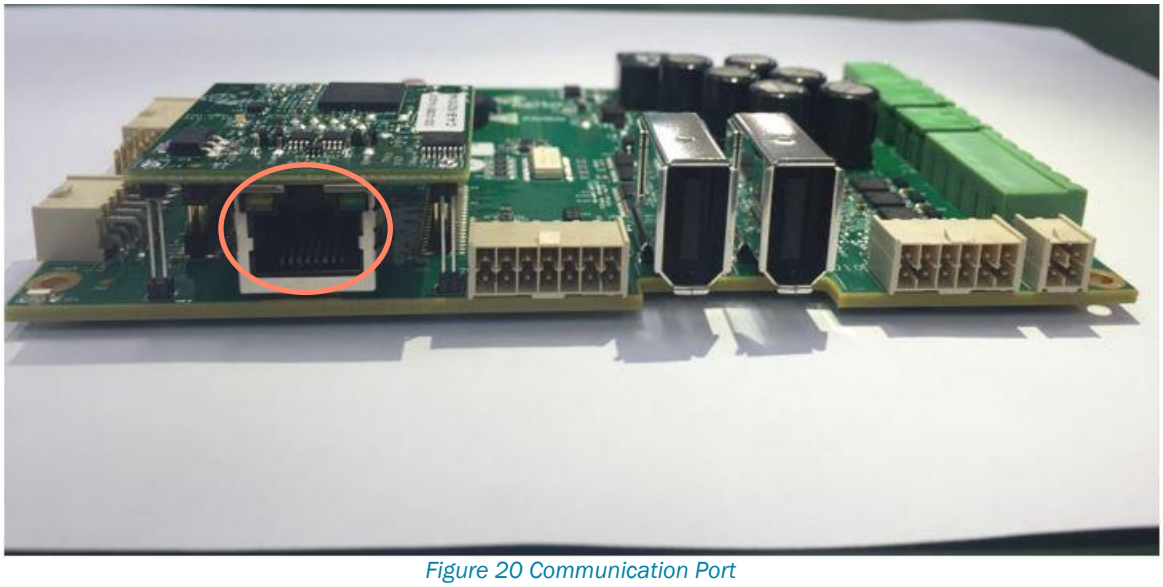


Figure 20 Communication Port

Description:	CONNECTOR, RJ45, PLUG, 8P8C, 1 PORT
Manufacturer:	TE
P/N (product side):	5-554720-2
Cable:	CAT5

Note:

1. The J11/J12 connectors are communication unit connectors and J13/J14 are mechanical connectors.
2. All of them are used to connect with another PCB board— CIGI-COM01-1A-02-01 to realize the communication between the master controller CIG1-MAS and the product. (The details of the board can be referred to in the hardware manual of CIGI-COM01-1A-02-01)
3. The RJ45 connector is between the two connectors to communicate with the master controller CIG1-MAS product variants via the Central-I Protocol

Environmental conditions

The table below shows the operating conditions for which this product can operate within

Requirement	Units	Allowed range
Operational temperature	°C	0 to 50
Storage temperature	°C	-20 to 70
Humidity	%	<90

References

[1] Central-i PN SN Definitions 6 March 2016.docx, 06-03-2016, V1.3