UniClOGS Power Delivery Board

Power Outputs:

Output channels can be configured for one of several modes. Output configuration is done by populating or leaving some other components unpopulated. A + denotes a current leaving the board, and a - denotes a current entering the board. Note that all banks do not support all current modes. Do not populate components that are not specified. Ensure that the output current from all outputs on each power input does not exceed the maximum input current.

Bank A:

Available modes:
- -500mA
- +16A
- +16A with soft start

Configuration Instructions:
The channel supports 12-24AWG wire
Each channel may be configured independently
If you populate the P channel MOSFETs, populate the 10k pullup resistors
Use the 3pad jumper to select 5 or 12v for the +16A mode
In soft start mode, adjust R_{gate} to adjust soft start time

Mode	Dual MOSFET	P MOSFET	R_{gate}	C	2pad Jumper
-500mA	Yes				Jumped
+16A	Yes	Yes	1k		Open
+16A soft-start	Yes	Yes	680k	Yes	Open

Bank B and C:

Available Modes:
- ±1.5A
- -500mA

Configuration Instructions:
These channels support 16-26AWG wire
A channel pair is an even channel and the next odd channel (e.g. 0 and 1)
Each channel pair must be configured for the same mode.

Mode	Dual Driver	Dual MOSFET
-500mA		Yes
±1.5A	Yes	

Power Inputs

Input:

Power is supplied to the 3 position connector on the left edge of the board. The pinout is

+12V 25A
GND 16A
+5V 16A

The board does not draw or provide any power to the raspberry pi
Each input supports 8-24AWG wire.

Protection:

Each power input has reverse polarity protection.
There is no overcurrent protection. Be sure to not to draw too much current from single or combination of outputs. See the channel documentation above to see the individual channel output currents.

- Channel A supports up to 18A of total output current on 5V
- Channel A and B share 18A of total output current on 12V
- Channel C has 7A of total output current at 12V independent of channels A and B

Outputs:

Power indicator LEDs are in the lower left corner of the board. Next to them are power output pins.

These pins are capable of 1A each, except for 3.3V which is capable of 250mA

Analog Inputs

Main Inputs

Each board has 4 analog inputs available on the top left 8 pin connector. The pinout is

ADC0	Agnd	ADC1	Agnd	ADC2	Agnd	ADC3	Agnd

Agnd is connected to general ground by the left link at the top of the Analog In section. This link can be replaced by a 0805 ferrite bead if desired.
Be careful to avoid ground loops when connecting to the Agnd pins

.1" Inputs

The analog inputs are also available on the .1" header above the main connector. The pinout of this connector is

ADC0	ADC1	ADC2	ADC3	Agnd

Data Connectors

1x IDC 40 pin connector for the Raspberry pi

	Odd	Even	
	01	02	
SDA1	03	04	
SCL1	05	06	GND
TX3	07	08	TX0
GND	09	10	TX0
$\overline{\text{TMP\_ALERT}}$ (GPIO17)	11	12	
$\overline{\text{ADC\_RDY}}$ (GPIO27)	13	14	GND
	15	16	
	17	18	
	19	20	GND
RX4	21	22	
	23	24	TX2
GND	25	26	
TX2	27	28	RX2
RX3	29	30	GND
$\overline{\text{IO\_RESET}}$ (GPIO6)	31	32	TX5
RX5	33	34	GND
	35	36	
	37	38	
GND	39	40	

The 3.3V and 5V pins on the Raspberry Pi are not connected

4 pin I^{2}C1

GND	3.3V	SCL1	SDA1

This is the internal I^{2}C bus used to communicate with the card

4 pin (2x2) Signals

$\overline{\text{ADC\_RDY}}$	$\overline{\text{TMP\_ALERT}}$
$\overline{\text{IO\_RESET}}$	gnd

3 pin Serial

gnd	RX (in)	TX (out)

These headers connect to (from top to bottom) UART0, UART2, UART3, UART4, UART5
UART2 can also double as I^{2}C0. To use this as I^{2}C0, populate R4 and R5, otherwise leave them empty

gnd	SCL0	SDA0

Signal Configuration

All I^{2}C devices on the board are connected to I^{2}C1 on the Raspberry Pi.

Power Output Banks

The power output banks are controlled by MAX7310 I^{2}C expanders. Each power output bank can be configured to 1 of 8 I^{2}C addresses. The I^{2}C address for each bank is between 0x20 and 0x27. The 3 jumpers configure the 3 lower bits of the address, and the binary address is 0100{AD2}{AD1}{AD0}. The default jumpers connect the address pins to SCL (0) and SDA (1). See the datasheet if more addresses are required. Banks A,B and C have the default addresses of 0x20, 0x21, and 0x22. The active low $\overline{\text{IO\_RESET}}$ signal is connected to the Raspberry Pi. Ensure that this signal is held high through boot to not reset the expanders. $\overline{\text{IO\_RESET}}$ is pulled high by a 4.7k resistor. See the datasheet for device usage.

ADC

The ADC is an ADS1115IDGS I^{2}C ADC with a default address of 0x48. Use the jumper to select the alternate address of 0x49 if required. The active low $\overline{\text{ADC\_RDY}}$ signal is connected to the Raspberry Pi connector. $\overline{\text{ADC\_RDY}}$ is pulled high by a 4.7k resistor. See the datasheet for device usage.

Temperature Sensor

The temperature sensor is an ADT7410TRZ I^{2}C Temperature Sensor. The default address is 0x4A. Use the left jumper to select the alternate address of 0x4B if required. Note that only the A0 pin is used and the A1 pin is tied to 3.3V to avoid address conflicts with the ADC. Additionally, the sensor can also create two alert or alarm signals which are active low and connected to $\overline{\text{TMP\_ALERT}}$. Use the right jumper to select between the "Critical Overtemperature" (CT) and "Overtemperature and Undertemperature" (INT) signals. $\overline{\text{TMP\_ALERT}}$ is pulled high by a 4.7k resistor. See the datasheet for device usage.

Using Multiple Boards

Two of these boards may be used in together to provide additional output channels. To do this, the first board should be configured in the default configuration. On the second board:

- Change the AD2 jumper on each bank from 0 to 1. Banks A, B, and C will now be on I^{2}C addresses 0x24, 0x25, and 0x26

- Change the address jumper on the ADC to 0x49

- Change the address jumpers on the temperature sensor to 0x4B

- Connect the 40 pin IDC connector to both boards in parallel

  - Alternately, connect the 4 pin (2x2) Signals connector and the 4 pin (1x4) I^{2}C1 connector except for the 3.3V pin directly between the two boards