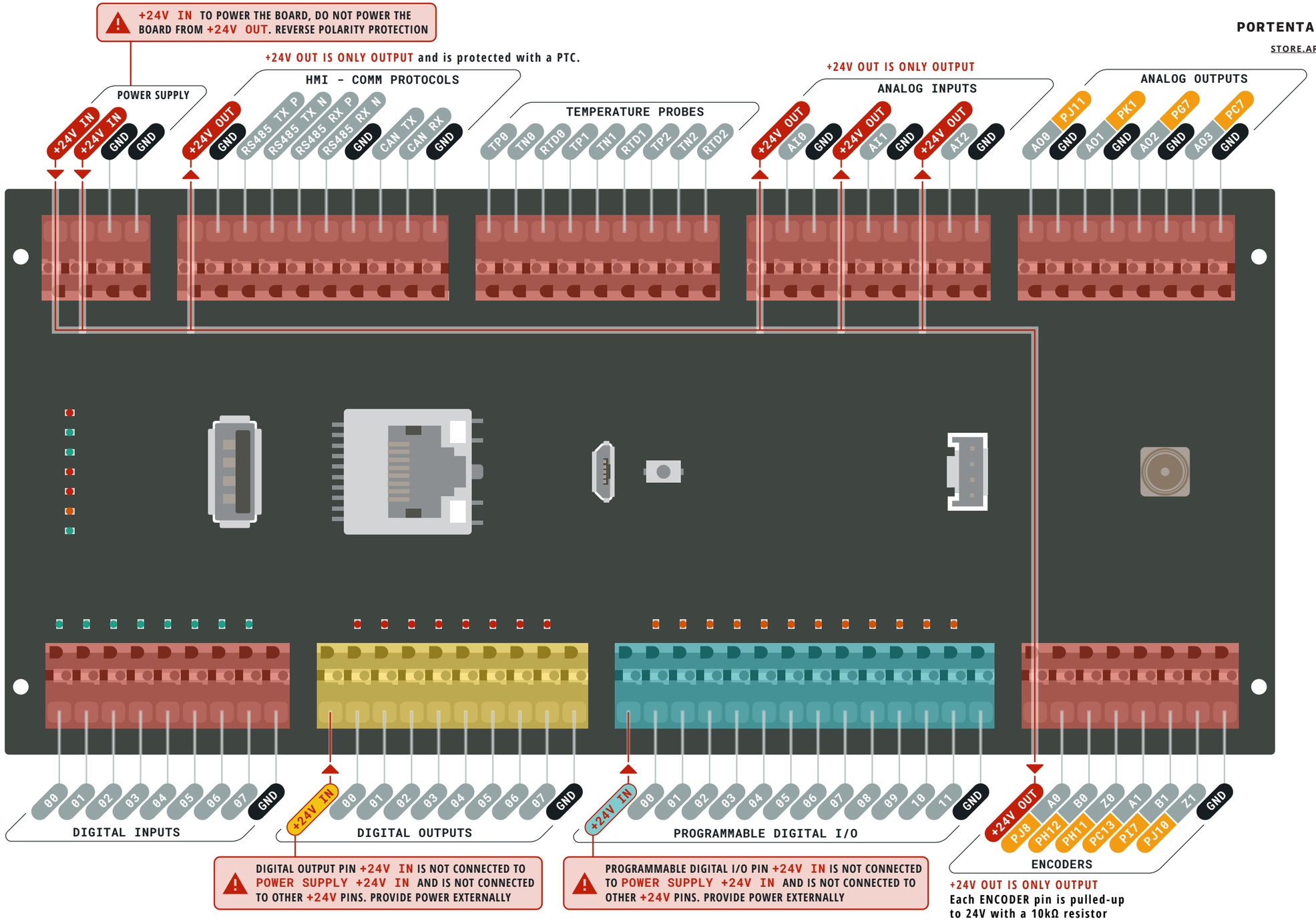
ARDUINO

ARDUINO PORTENTA MACHINE CONTROL

STORE.ARDUINO.CC/MACHINE-CONTROL



- Ground
- Power
- LED
- Internal Pin
- Microcontroller's Port
- High Density Connector

GND is common through the board

ARDUINO.CC

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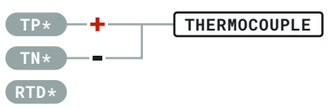
TEMPERATURE PROBES

TERMOCOUPLE SUPPORTED J K

Connection diagram:



CONNECT THE THERMOCOUPLE NEGATIVE TO TN, NOT TO GND

RTD SUPPORTED PT100

Connection diagram, with 2 wires RTD:

ADD JUMPER BETWEEN TP* AND RTD* PINS

Connection diagram, with 3 wires RTD:

⚠ TEMPERATURE PROBES PINS CAN BE CONNECTED ONLY WITH COMPATIBLES THERMOCOUPLES OR RTDs, NO DIRECT VIN SHOULD BE CONNECTED TO THE PINS

ANALOG INPUTS

THE 3 ANALOG INPUT PINS CAN MEASURE VOLTAGE IN 3 WAYS:

0-10V function (DEFAULT):

MAXIMUM INPUT VOLTAGE IS 10V

4-20mA function:

MAXIMUM CURRENT IS 20mA
MAXIMUM VOLTAGE IS 3V3

NTC function:

All +24V OUT ANALOG INPUT pins are connected and protected by a single PTC.

PTC MAXIMUM CURRENT IS 500mA

⚠ DO NOT CONNECT DIRECTLY +24V IN OR +24V OUT TO AI*

⚠ BE CAREFUL BEFORE CHANGING THE FUNCTION THAT THE WIRING IS CORRECTLY DONE, HIGH RISK OF BOARD DAMAGE!

ANALOG OUTPUTS

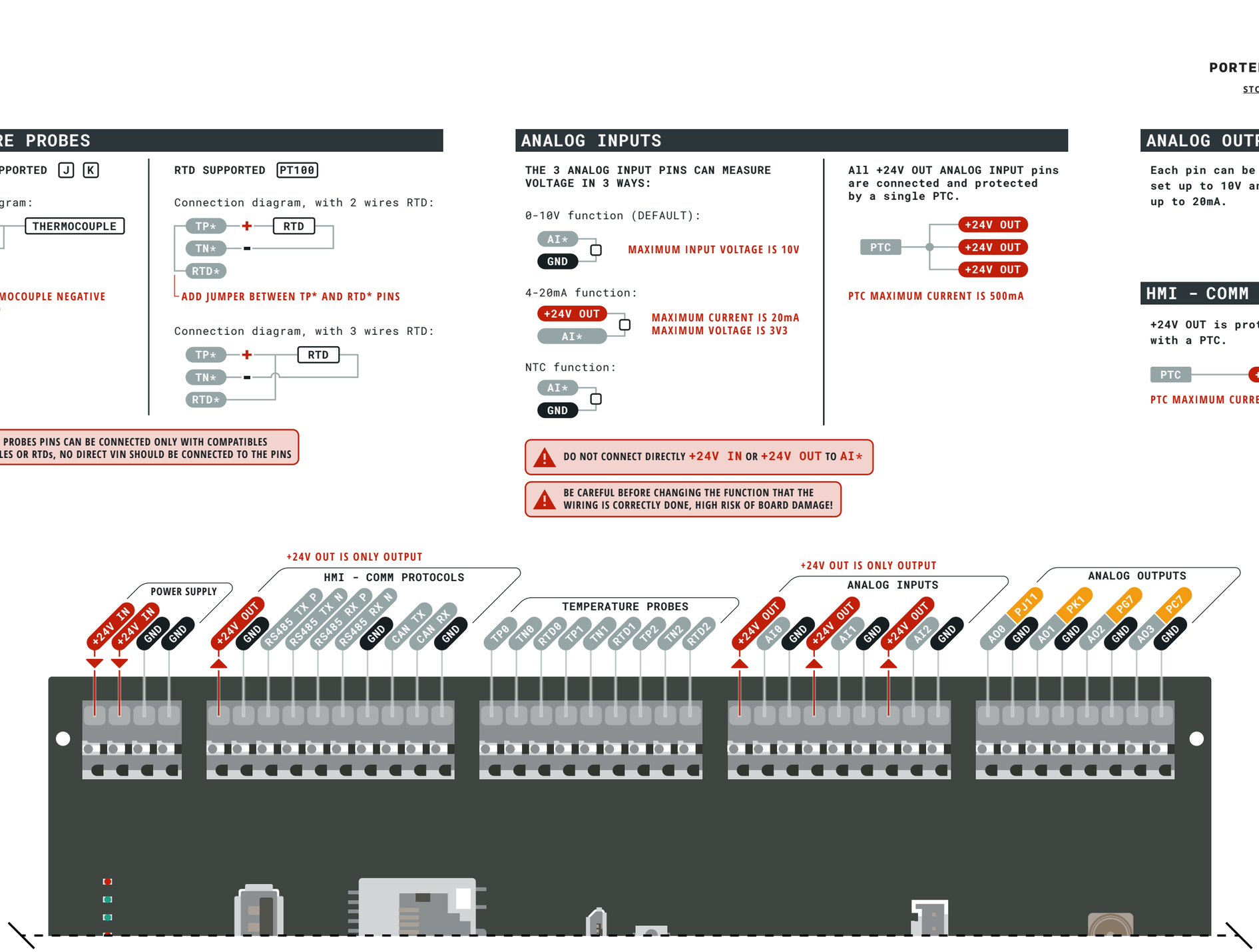
Each pin can be independently set up to 10V and can source up to 20mA.

HMI - COMM PROTOCOLS

+24V OUT is protected with a PTC.

PTC MAXIMUM CURRENT IS 500mA

+24V OUT IS ONLY OUTPUT



Ground
Power
LED
Internal Pin

Microcontroller's Port
High Density Connector

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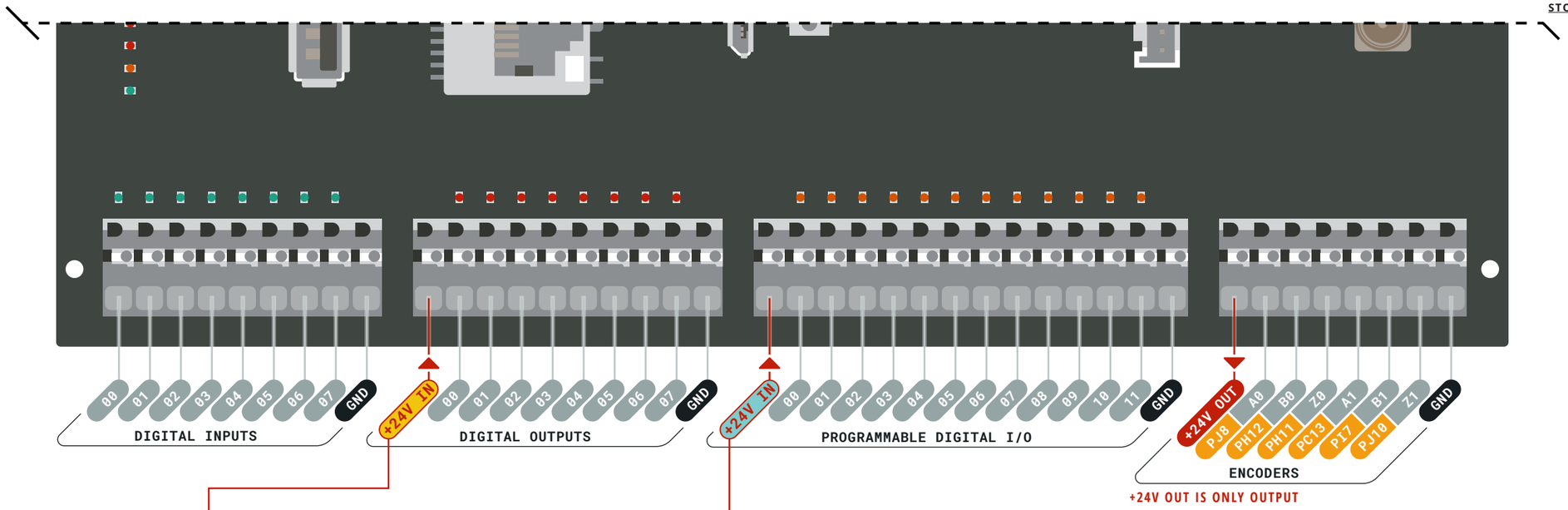
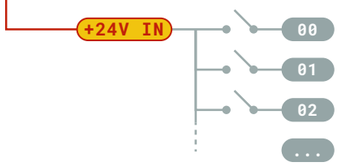


⚠ DIGITAL OUTPUT PIN +24V IN IS NOT CONNECTED TO POWER SUPPLY +24V IN AND IS NOT CONNECTED TO OTHER +24V PINS. PROVIDE POWER EXTERNALLY

⚠ PROGRAMMABLE DIGITAL I/O PIN +24V IN IS NOT CONNECTED TO POWER SUPPLY +24V IN AND IS NOT CONNECTED TO OTHER +24V PINS. PROVIDE POWER EXTERNALLY

DIGITAL OUTPUTS

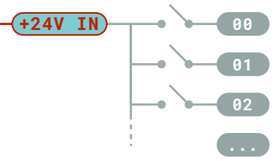
- The pins are connected with the +24V IN with high side switches:



MAXIMUM CURRENT IS 500mA FOR EACH PIN

PROGRAMMABLE DIGITAL I/O

- The output voltage can be readed, if HIGH or LOW.
- The pins are connected with the +24V IN with high side switches:



MAXIMUM CURRENT IS 500mA FOR EACH PIN

ENCODERS

+24V OUT is protected with a PTC.

PTC MAXIMUM CURRENT IS 500mA

Each pin is pulled-up to 24V with a 10kΩ resistor.

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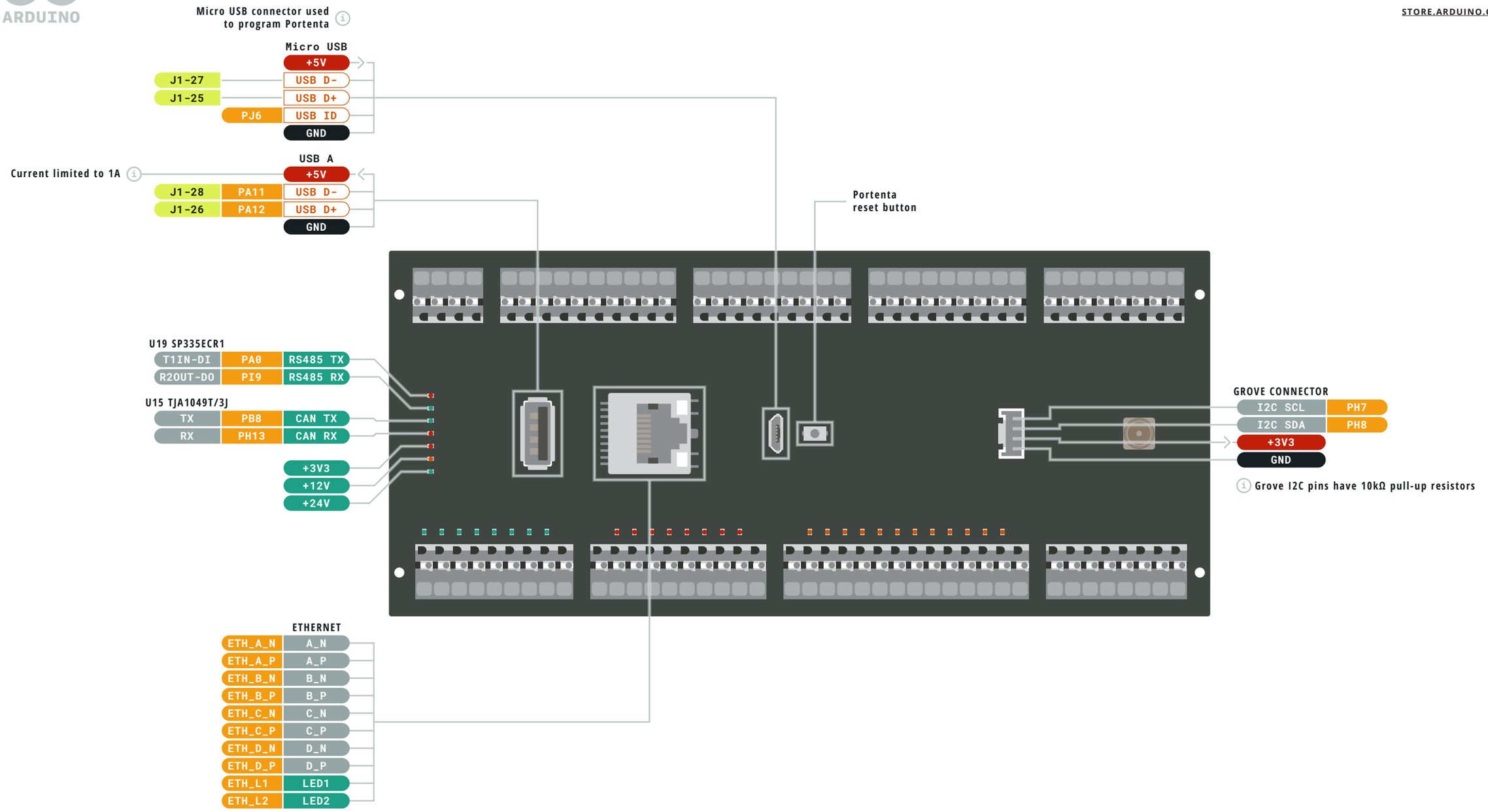

Ground
Power
LED
Internal Pin

Microcontroller's Port
High Density Connector

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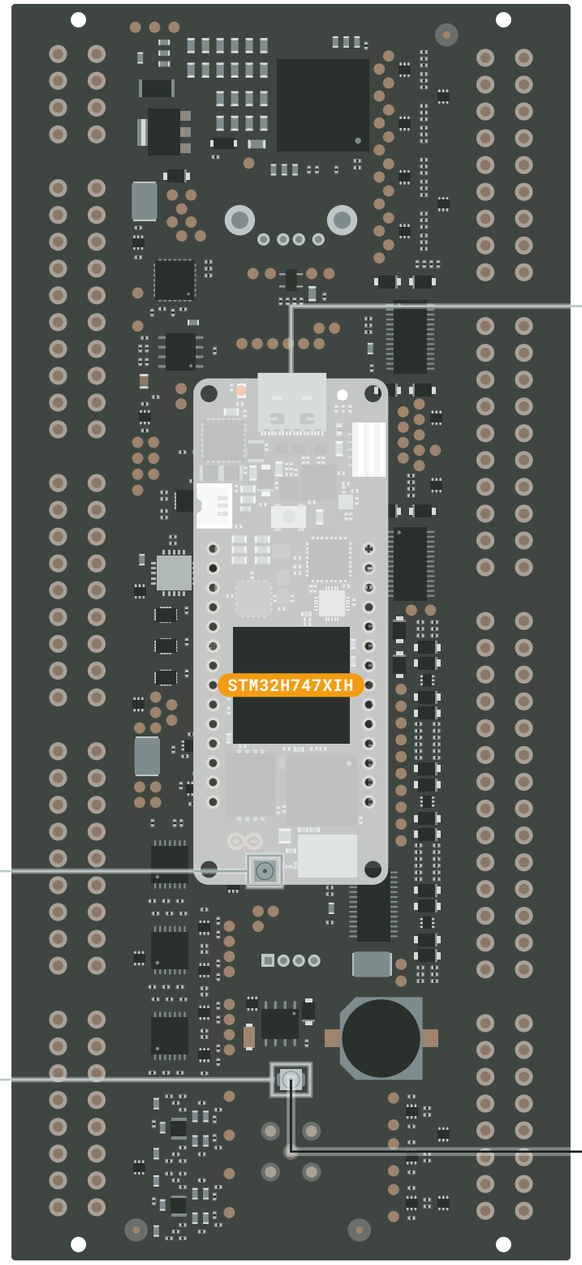
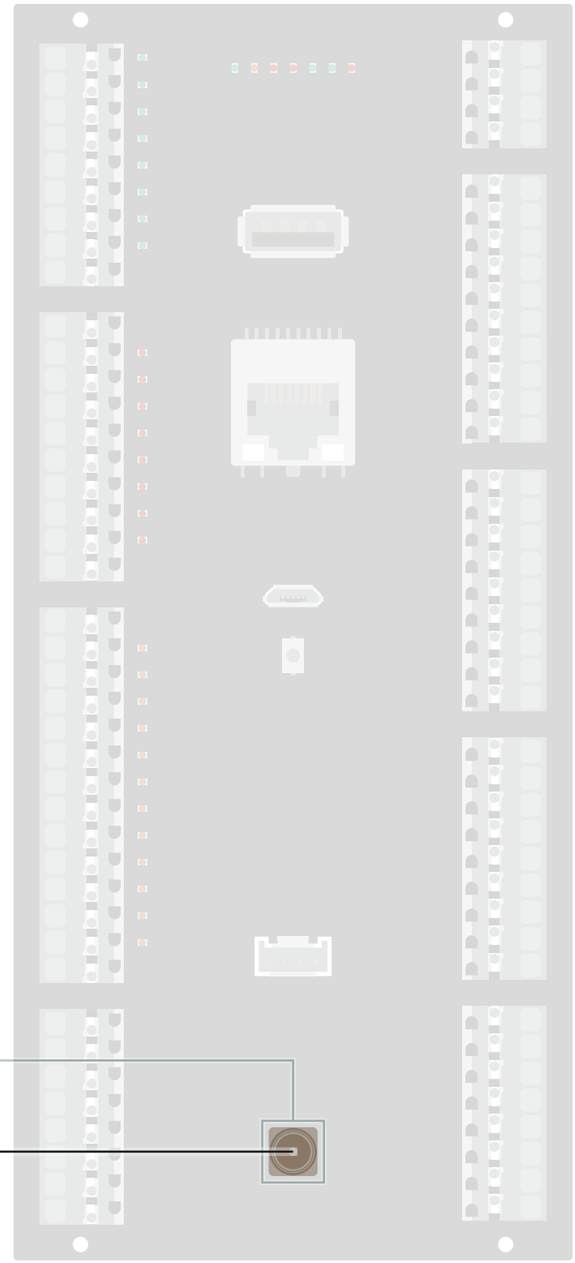
BOTTOM VIEW





- Ground
- Power
- LED
- Internal Pin
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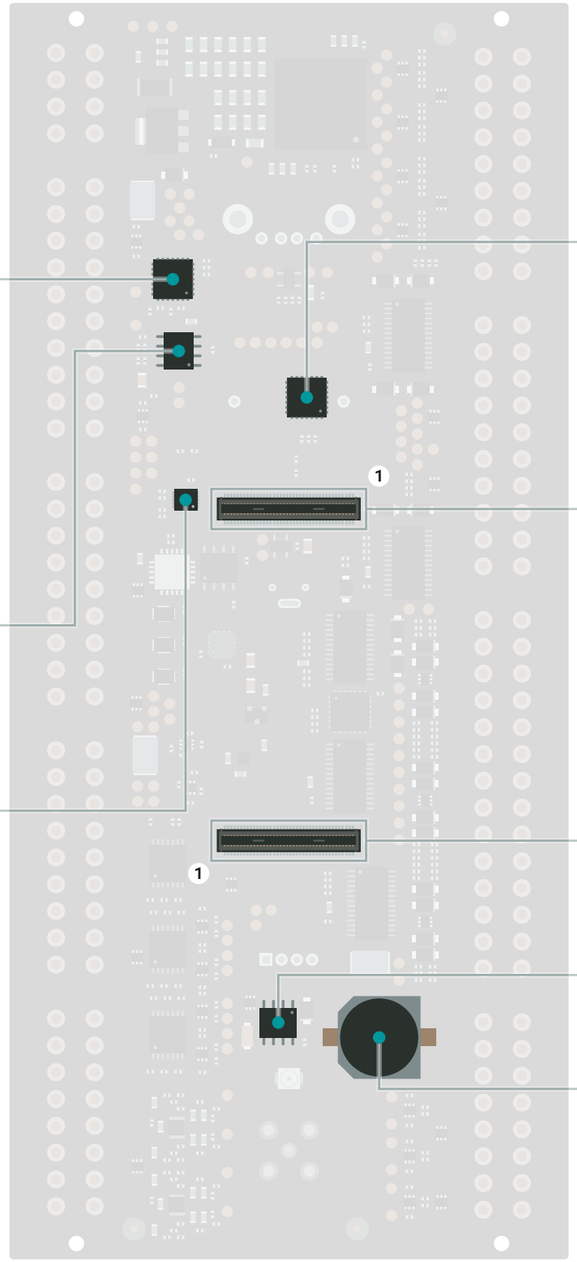
BOTTOM VIEW



RS485-RS232

Functionality: RS232	Functionality: RS485 half duplex	Functionality: RS485 full duplex
TX	B/Z	Z
	A/Y	Y
		B
RX		A

120Ω termination resistors are integrated and can be connected/disconnected via FW configuration

U19 SP335ECR1

Pin Name		
RS485 TX N	T1OUT,B/Z	3
RS485 TX P	T2OUT,A/Y	4
RS485 RX N	R1IN,B	19
RS485 RX P	R2IN,A	18
PA0	T1IN-DI	
PI13	T2IN-DE	
PI10	$\overline{RE}$	
PI9	R2OUT-DO	
PA9	HALF-$\overline{FULL}$	
PA10	RS485-$\overline{RS232}$	
PG14	$\overline{SLEW}$	
PI15	FD_TX_TERM	
PI14	TERM	
PG9	$\overline{SHDN}$	

CAN

U15 TJA1049T/3J

CAN TX	PB8	TX
CAN RX	PH13	RX
	PA13	$\overline{STB}$

Pin Name	
CAN RX	CANL
CAN TX	CANH

USB POWER SWITCH

U24 NCP383LMUAJAATXG

PB14	$\overline{EN1}$
PB15	$\overline{FLAG}$

DIGITAL INPUTS

IO EXPANDER
U25 TCA6424ARGJR

SDA	PH8
SCL	PH7
P05	
P04	
P02	
P01	
P00	
P07	
P06	
P10	
$\overline{INT}$	PB4

Pin Name
01
02
03
04
05
06
07
08

J1-Female

J2-Female

RTC

U18 PCF8563T

SDA	PB7
SCL	PB6
$\overline{INT}$	PB9

RTC SUPERCAP
100mF, FC0V104ZFTBR24

- Ground
- Power
- LED
- Internal Pin
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BOTTOM VIEW

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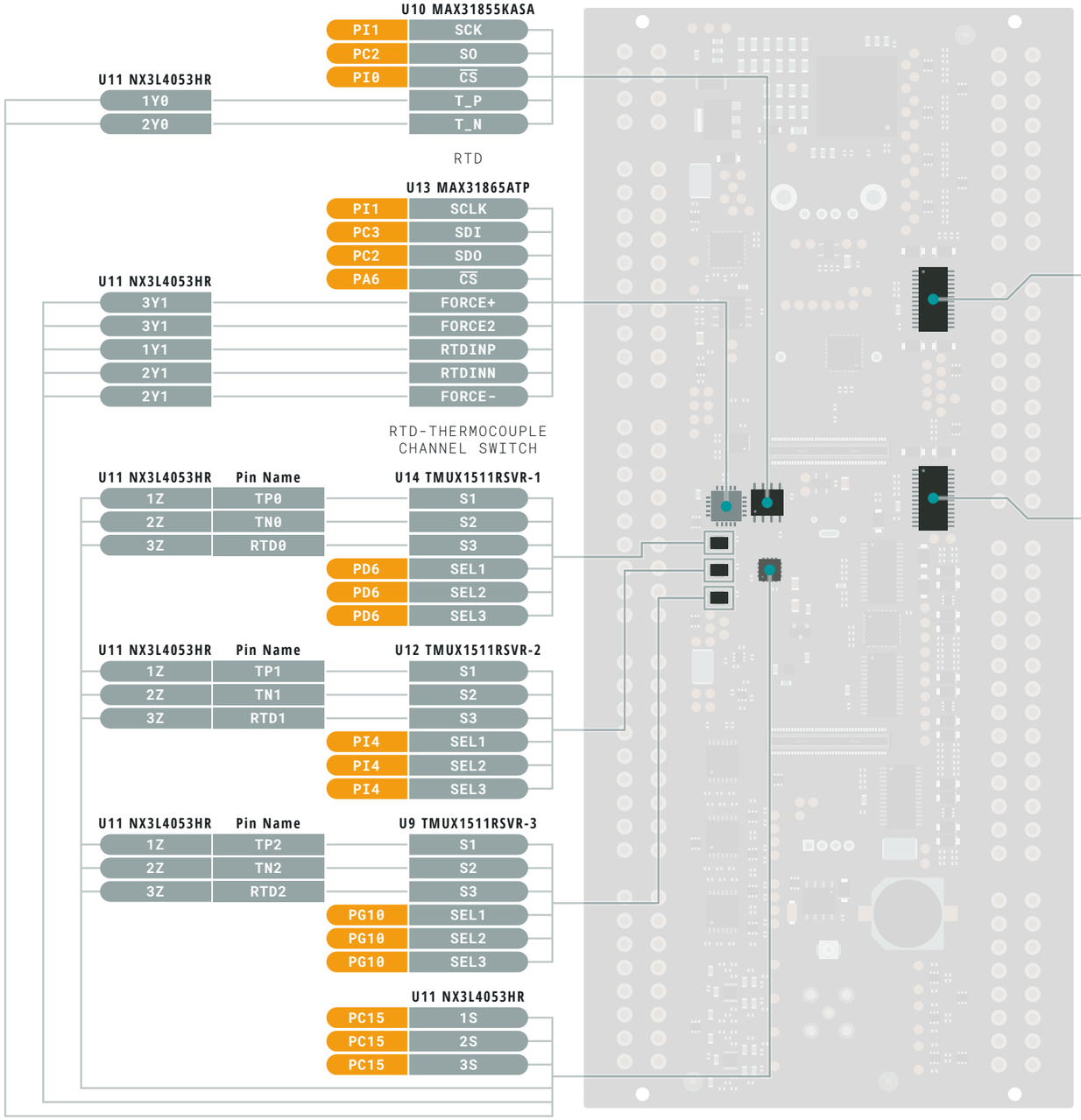

ⓘ Digital Outputs THER pins are controlled by PB2

- Ground
- Power
- LED
- Internal Pin
- Microcontroller's Port
- High Density Connector

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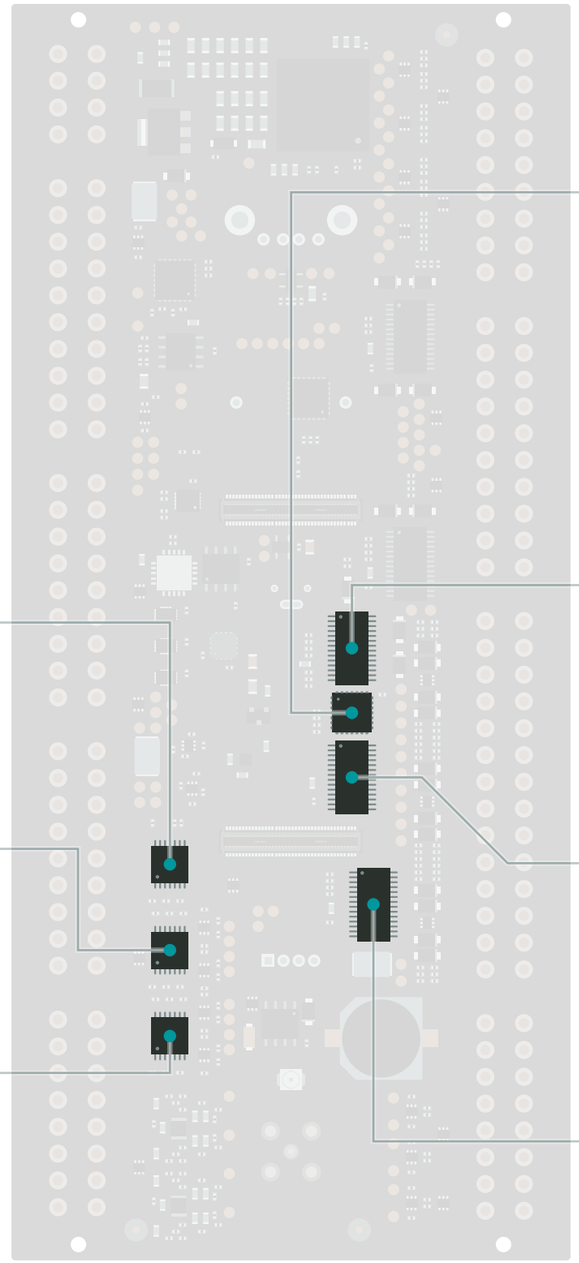
BOTTOM VIEW



ANALOG INPUTS CHANNEL SWITCH

U4 TS12A44514PWR-1

Pin Name		
	+3V3	COM1/NTC REF
	PC3_C	COM2
AI0		NO1
	PD4	IN1
	PD5	IN2
	PE3	IN3
	PG3	IN4

U5 TS12A44514PWR-2

Pin Name		
	+3V3	COM1/NTC REF
	PC2_C	COM2
AI1		NO1
	PD7	IN1
	PH6	IN2
	PJ7	IN3
	PH15	IN4

U6 TS12A44514PWR-3

Pin Name		
	+3V3	COM1/NTC REF
	PA1_C	COM2
AI2		NO1
	PH10	IN1
	PA4	IN2
	PA8	IN3
	PC6	IN4

⚠ EACH PORTENTA PIN CONNECTED TO AN ANALOG INPUT IN* PIN IS INVERTED BY A TRANSISTOR

PROGRAMMABLE DIGITAL I/O

IO EXPANDER U21 TCA6424ARGJR

			Pin Name
	SDA	PH8	
	SCL	PH7	
P27	READ_CH00		00
P26	READ_CH01		01
P25	READ_CH02		02
P24	READ_CH03		03
P23	READ_CH04		04
P22	READ_CH05		05
P21	READ_CH06		06
P20	READ_CH07		07
P17	READ_CH08		08
P16	READ_CH09		09
P15	READ_CH10		10
P14	READ_CH11		11
	INT	PI5	

U20 TPS4H160AQPWPRQ1-1

			Pin Name
	OUT1		00
	OUT2		01
	OUT3		02
	OUT4		03
	THER	PH14	U21 TCA6424ARGJR
	IN1		P00/EN_CH0
	IN2		P01/EN_CH1
	IN3		P02/EN_CH2
	IN4		P03/EN_CH3

U22 TPS4H160AQPWPRQ1-2

			Pin Name
	OUT1		04
	OUT2		05
	OUT3		06
	OUT4		07
	THER	PH14	U21 TCA6424ARGJR
	IN1		P04/EN_CH7
	IN2		P05/EN_CH6
	IN3		P06/EN_CH5
	IN4		P07/EN_CH4

U23 TPS4H160AQPWPRQ1-3

			Pin Name
	OUT1		08
	OUT2		09
	OUT3		10
	OUT4		11
	THER	PH14	U21 TCA6424ARGJR
	IN1		P10/EN_CH8
	IN2		P11/EN_CH9
	IN3		P12/EN_CH10
	IN4		P13/EN_CH11

ⓘ Digital Programmable THER pins are controlled by PH14

- Ground
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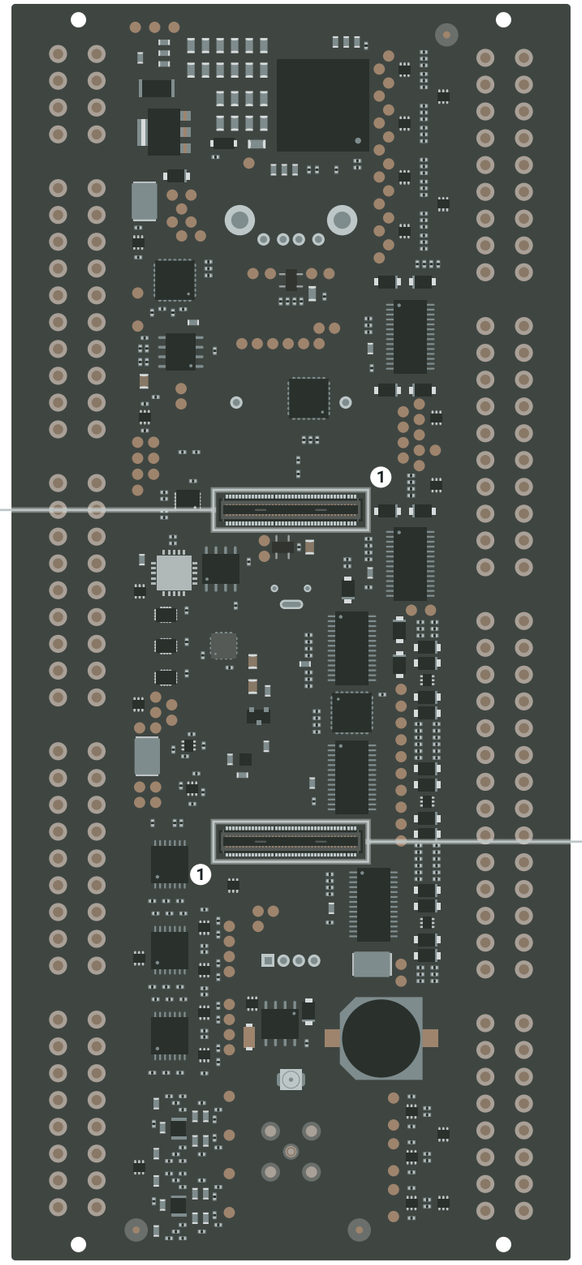
J1-Female

ETH A+	1	2		
ETH A-	3	4		
ETH B+	5	6		
ETH B-	7	8		
	9	10	DSI D1+	
	11	12	DSI D1-	
	13	14	DSI D0+	
	15	16	DSI D0-	
ETH L1	17	18	DSI CK+	
ETH L2	19	20	DSI CK-	
VIN	21	22	GND	
USB1 VBUS	23	24		
USB1 D+	25	26	USB0 D+	
USB1 D-	27	28	USB0 D-	
USB1 ID	29	30		
GND	31	32	VIN	
UART1 TX	33	34	UART0 TX	
UART1 RX	35	36	UART0 RX	
UART1 RTS	37	38	UART0 RTS	
UART1 CTS	39	40	UART0 CTS	
VIN	41	42	GND	
I2C1 SDA	43	44	I2C0 SDA	
I2C1 SD6	45	46	I2C0 SCL	
GND	47	48	VIN	
CAN1 TX	49	50		
CAN1 RX	51	52		
VSYS	53	54	GND	
SDC CLK	55	56	I2S MCK	
SDC CMD	57	58	I2S WS	
SDC D0	59	60	I2S DI	
SDC D1	61	62	I2S DO	
SDC D2	63	64	VSYS	
SDC D3	65	66	DMIC CK	
	67	68	DMIC D0	
	69	70		
	71	72	V-SDCARD	
RESET	73	74		
SWDIO	75	76		
SWCK	77	78		
SWO	79	80		

BOTTOM VIEW



J2-Female

ADC A7	80	79	ADC A3	
ADC A6	78	77	ADC A2	
ADC A5	76	75	ADC A1	
ADC A4	74	73	ADC A0	
ADC VREF-	72	71	ADC VREF+	
GND	70	69	VCC/+3V3	
PWM 10	68	67	PWM 5	
PWM 9	66	65	PWM 4	
PWM 8	64	63	PWM 3	
PWM 7	62	61	PWM 2	
PWM 6	60	59	PWM 1	
GPIO 6	58	57	GND	
GPIO 5	56	55		
GPIO 4	54	53	SAI D0	
GPIO 3	52	51	SAI FS	
GPIO 2	50	49	SAI CK	
GPIO 1	48	47	I2C2 SCL	
GPIO 0	46	45	I2C2 SDA	
GND	44	43	VCC/+3V3	
SPI1 COPI	42	41		
SPI1 CIPO	40	39		
SPI1 CK	38	37		
SPI1 CS	36	35		
VCC	34	33	GND	
	32	31		
	30	29		
UART2 RX	28	27	UART3 RX	
UART2 TX	26	25	UART3 TX	
GND	24	23	VCC/+3V3	
CAM HS	22	21		
CAM CLK	20	19		
CAM VS	18	17		
CAM D0	16	15		
CAM D1	14	13		
CAM D2	12	11		
CAM D3	10	9		
CAM D4	8	7	COINCELL	
CAM D5	6	5	POWER_ON_REQ	
CAM D6	4	3	BOOT_SOURCE	
CAM D7	2	1	FORCE_BOOTLOADER	

- Ground
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