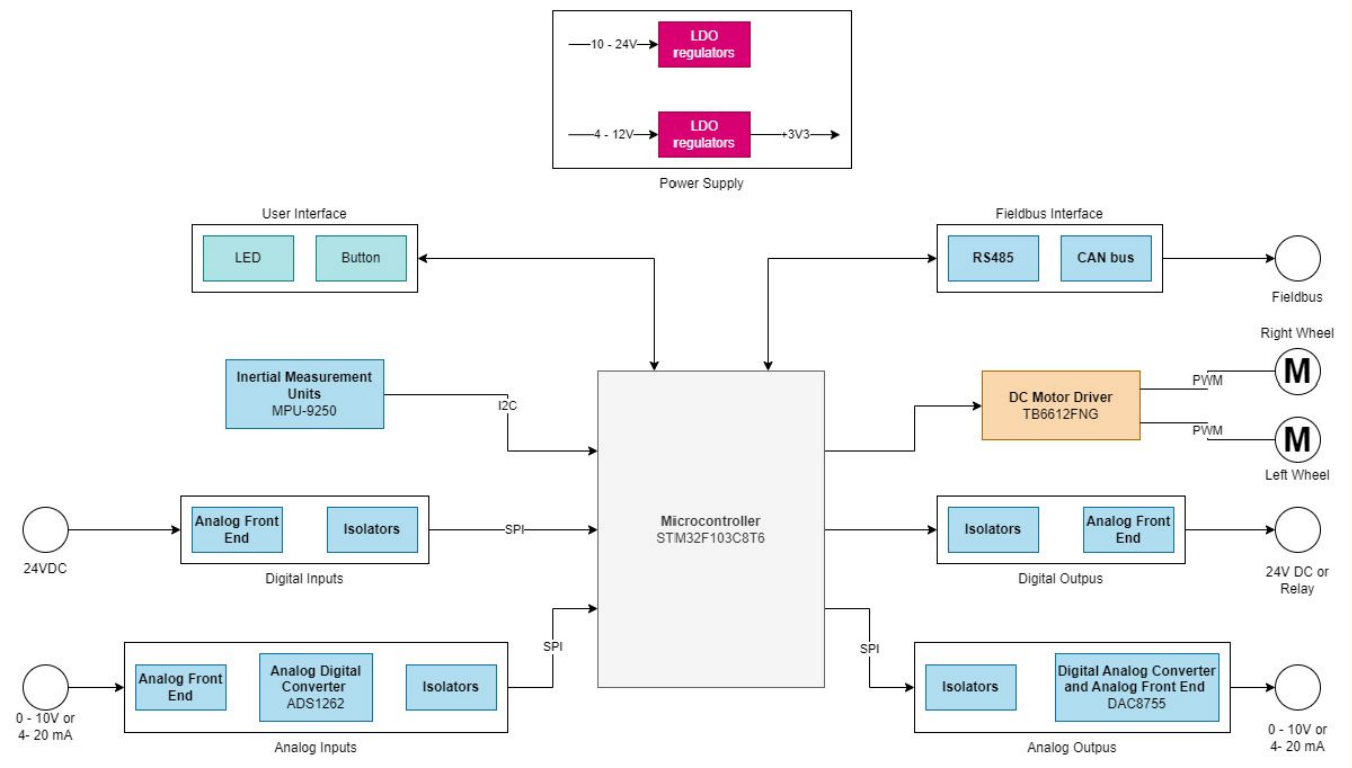
Two-Wheeled Balancing Robot v1.1



Power Supply

Inertial Measurement Units MPU-9250

Digital Inputs

Analog Inputs

Motor Driver TB6612FNG

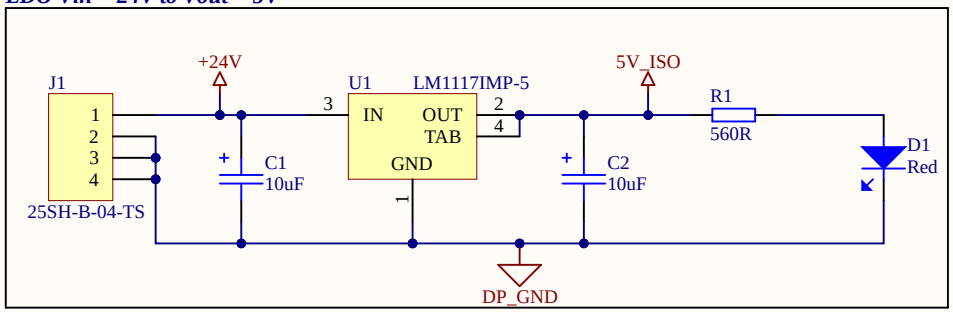
Digital Outputs

Analog Outputs

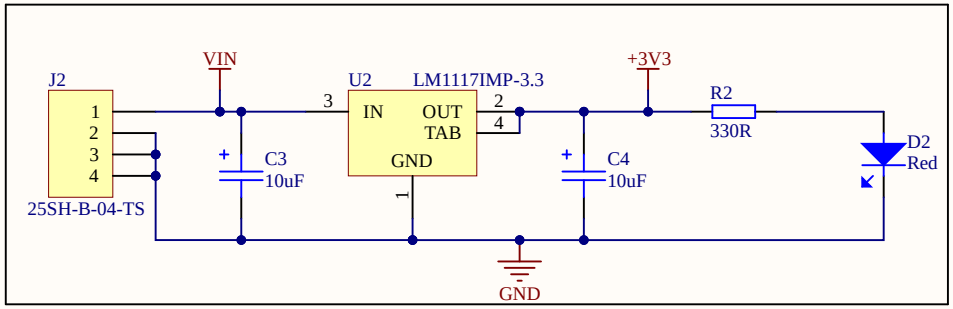
MCU STM32C8T6

[1] Power Supply (PS)

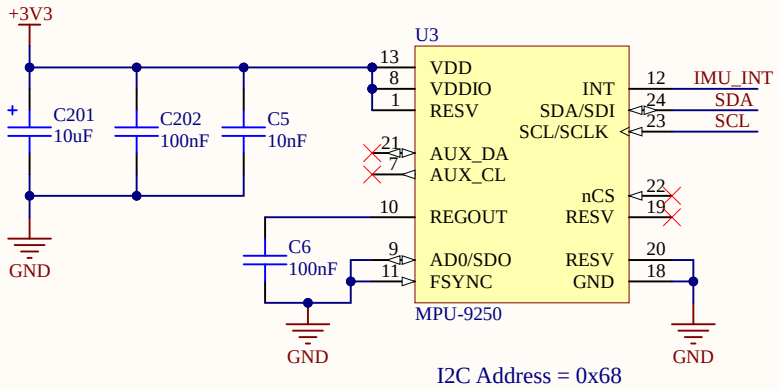
LDO Vin = 24V to Vout = 5V



LDO Vin = 4 - 12V to Vout = 3.3V



[2] Inertial Measurement Units (IMUs) Sensor



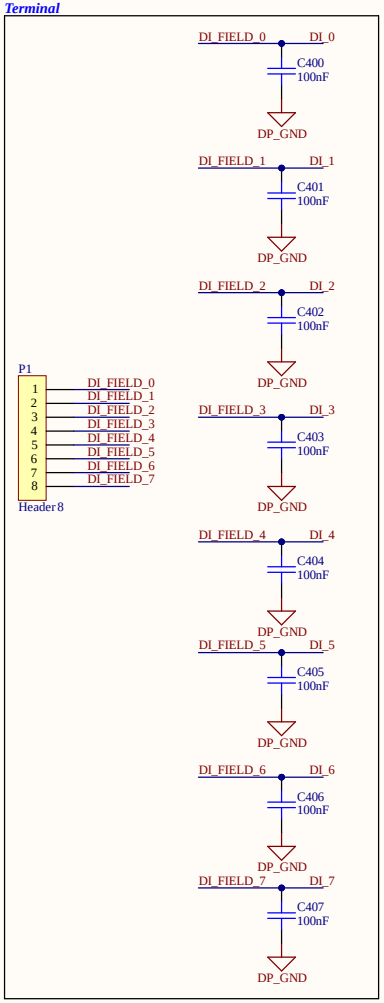
PARAMETER	CONDITIONS	MIN	TYP	MAX	Units	Notes
SUPPLY VOLTAGES						
VDD		2.4	2.5	3.6	V	
VDDIO		1.71	1.8	VDD	V	

Specification	Symbol	Conditions	MIN	MAX	Units
Supply Voltage	V_{DD}		-0.5	4.0	V
	V_{DDIO}		-0.5	4.0	V

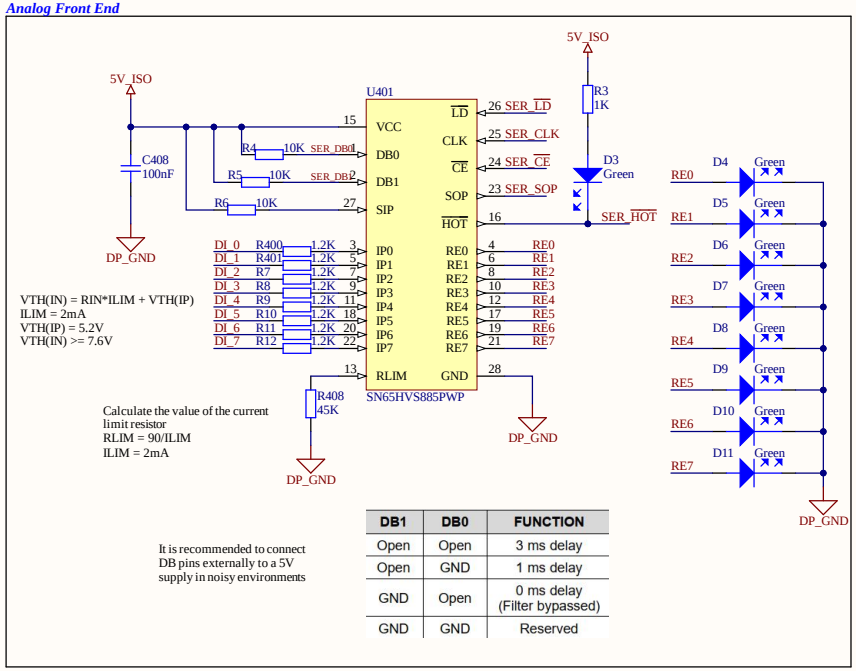
DESIGN NOTES
- AD0 connects to GND or VDD to specify the I2C address. Because we only use one sensor here, connect to one of those options.
- Typical Operating Circuit 22/52 Datasheet
- Reference Design: https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/downloads

[3] Digital Inputs (DI)

Terminal

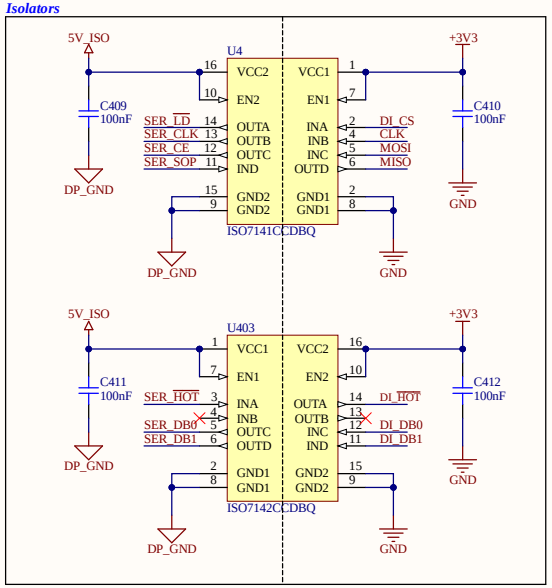


Analog Front End



DB1	DB0	FUNCTION
Open	Open	3 ms delay
Open	GND	1 ms delay
GND	Open	0 ms delay (Filter bypassed)
GND	GND	Reserved

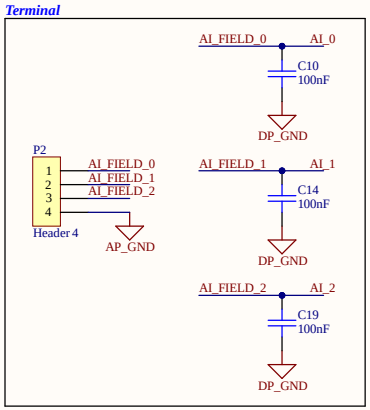
Isolators



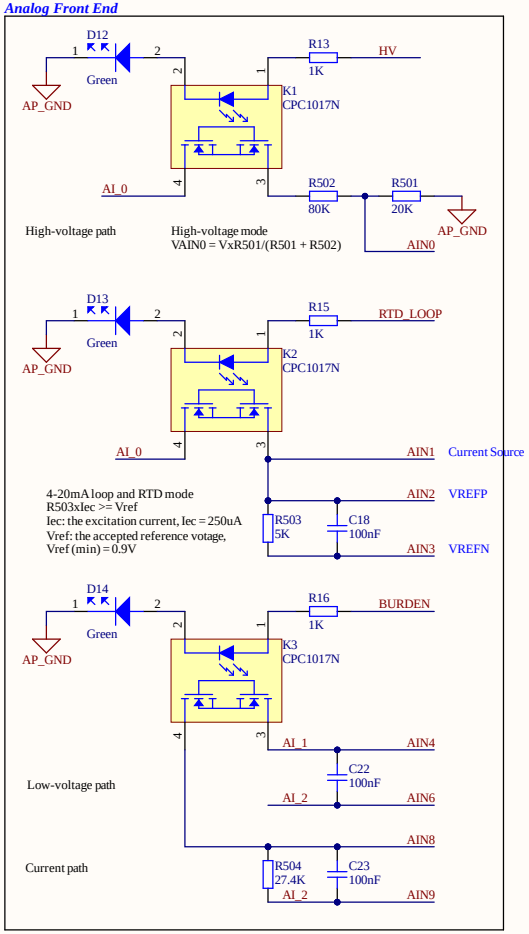
DESIGN NOTES
- Reference Design: TIDA-00017

[4] Analog Inputs (AI)

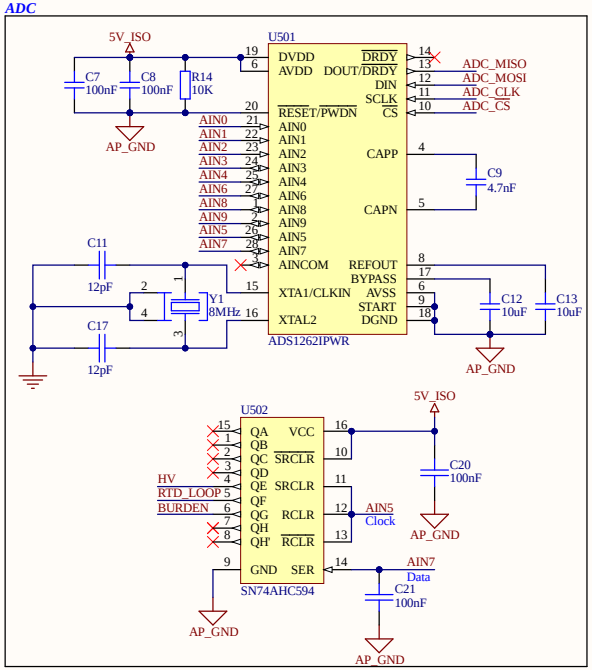
Terminal



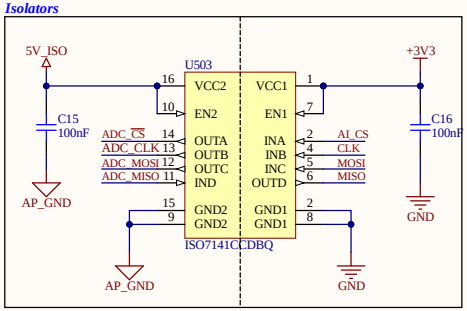
Analog Front End



ADC

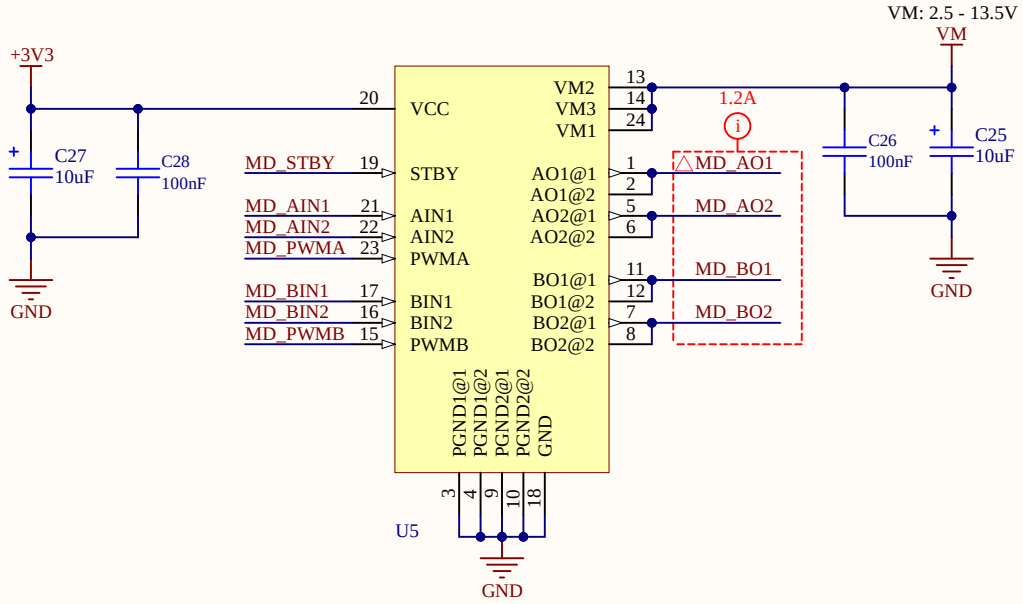


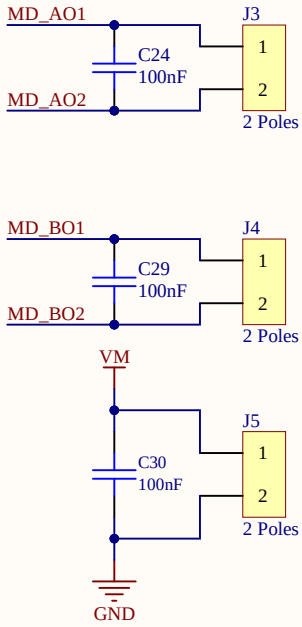
Isolators



DESIGN NOTES
- Reference Design: TIDA-00550

[5] Motor Driver (MD)





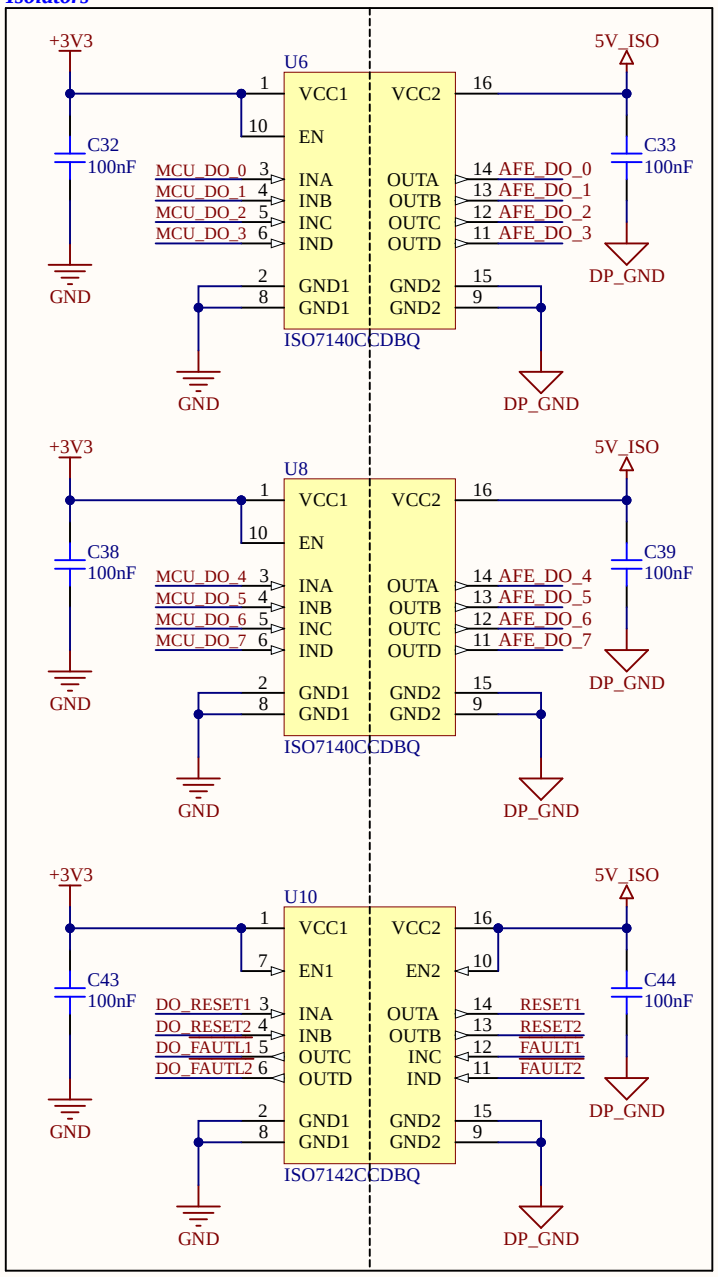
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Supply current	$I_{CC(3\ V)}$	STBY = Vcc = 3 V, VM = 5 V	—	1.1	1.8	mA
	$I_{CC(5.5\ V)}$	STBY = Vcc = 5.5 V, VM = 5 V	—	1.5	2.2	
	$I_{CC(STB)}$	STBY = 0 V	—	—	1	μA
	$I_{M(STB)}$		—	—	1	

Characteristics	Symbol	Rating	Unit	Remarks
Supply voltage	VM	15	V	
	V_{CC}	6		
Input voltage	V_{IN}	-0.2 to 6	V	IN1,IN2,STBY,PWM pins
Output voltage	V_{OUT}	15	V	O1,O2 pins
Output current	I_{OUT}	1.2	A	Per 1 ch
	I_{OUT} (peak)	2		tw = 20 ms Continuous pulse, Duty ≤ 20%
		3.2		tw = 10 ms Single pulse

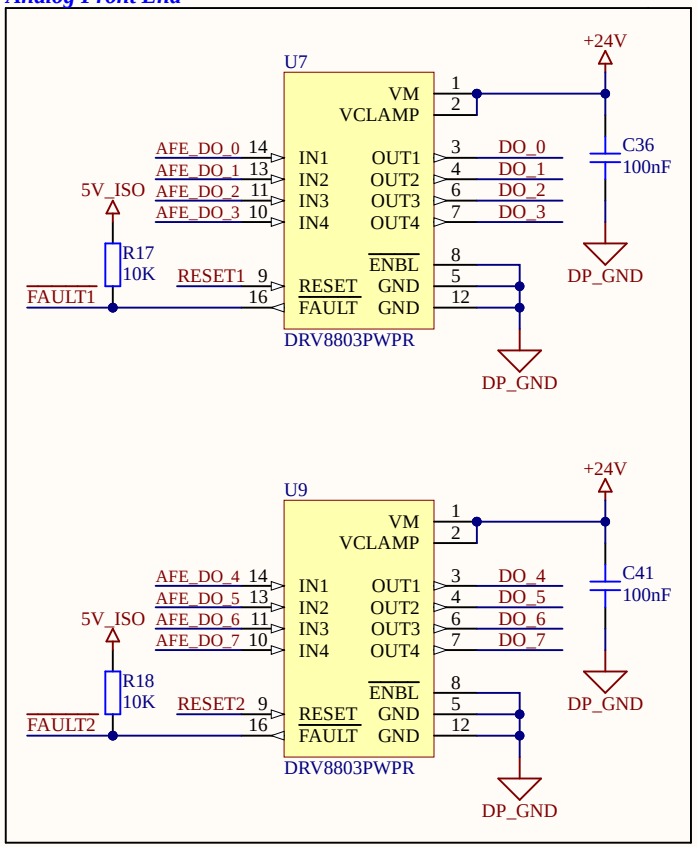
DESIGN NOTES
- Typical Application Diagram 7/11 Datasheet
- Reference Design:
https://learn.adafruit.com/adafruit-tb6612-h-bridge-dc-stepper-motor-driver-breakout/downloads

[6] Digital Outputs (DO)

Isolators

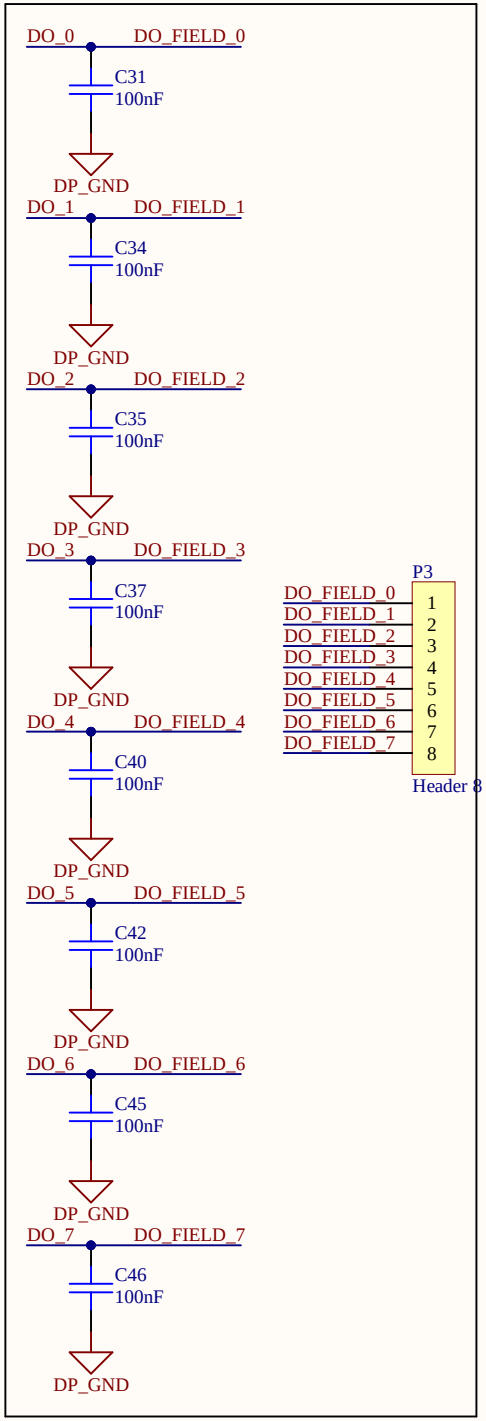


Analog Front End

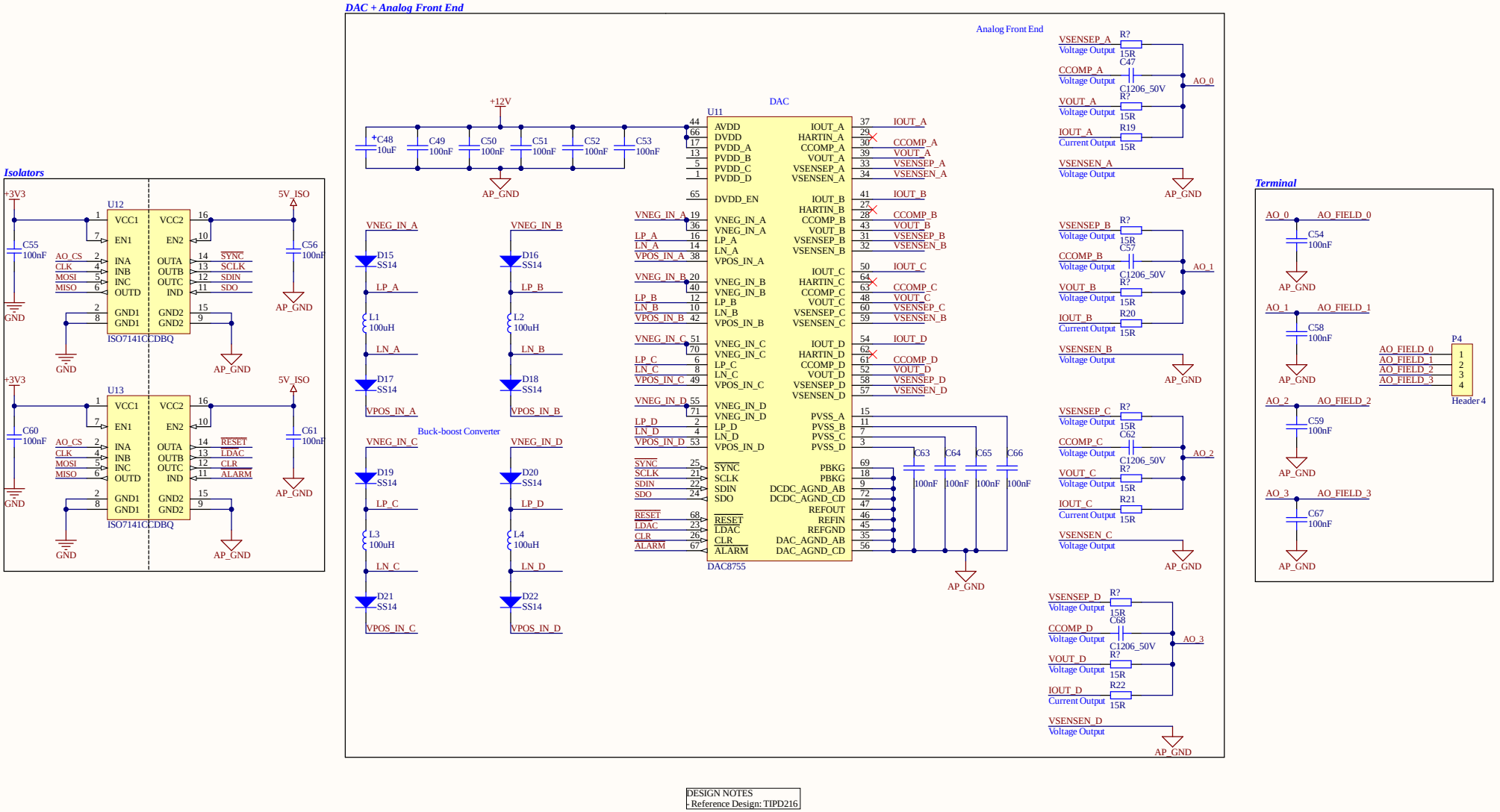


DESIGN NOTES
- Reference Design: TIDA-00320

Terminal

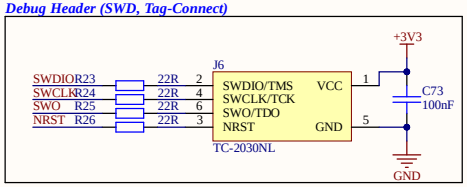


[7] Analog Outputs

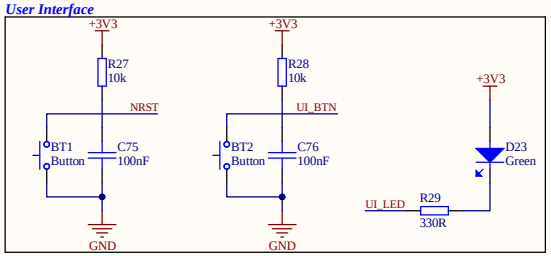


[8] Microcontroller (MCU)

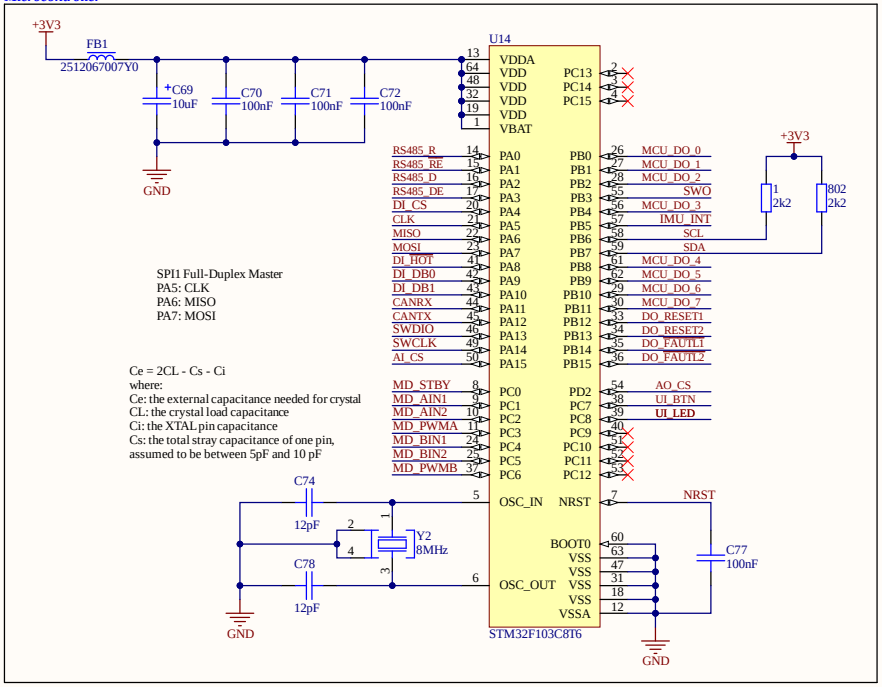
Debug Header (SWD, Tag-Connect)



User Interface



Microcontroller



Communication