

A

B

C

D

A

B

C

D

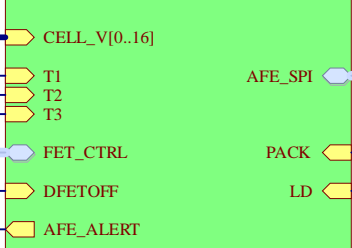
Battery Interface
Battery_Interface.SchDoc



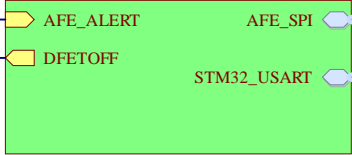
Temperature Sense
Temperature_Sense.SchDoc



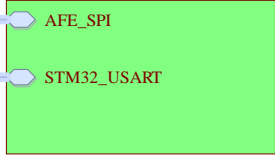
AFE
BQ76952_AFE.SchDoc



STM32 MCU
STM32_MCU.SchDoc



Pack Interface
Pack_Interface.SchDoc



VBAT+

High Side FETs
High_Side_FETs.SchDoc



VPACK+

Mounting Holes

MH1 MH2

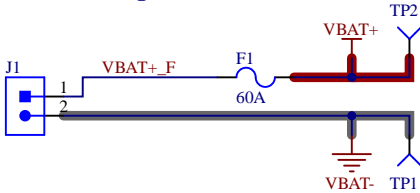
MH3 MH4

PROJECT LTO 16S BMS.PrjPcb, [No Variations]		University of Waterloo 200 University Ave W Waterloo, Ontario, Canada N2L 3G1		REV 1.0
DOCUMENT Top.SchDoc		MODIFIED 2023-08-03		
ENGINEER Farris Matar	REVIEWER *	SHEET 1 OF 8		

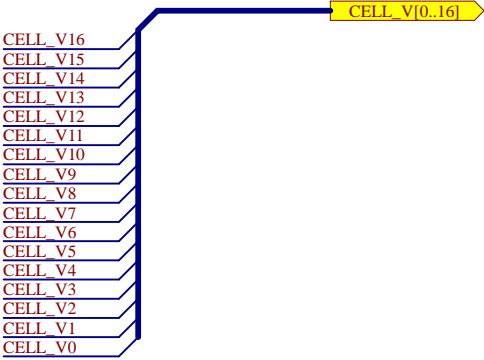
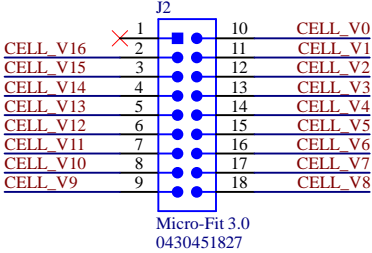
BATTERY INTERFACE

Battery specs:
- 16s1p 20Ah LTO battery
- 1.5V - 2.7V cell voltage range, 2.3V nominal

Power Input

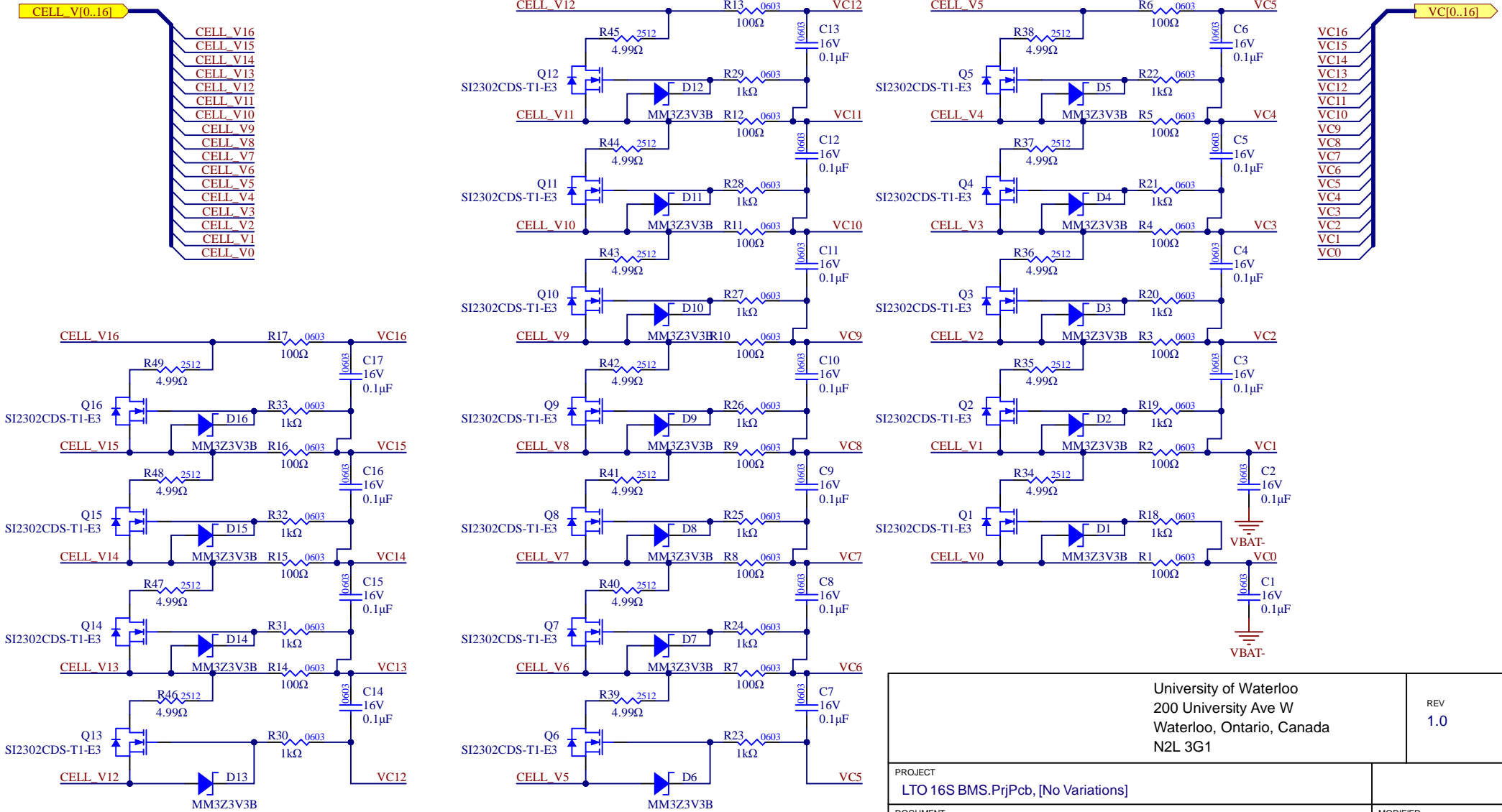


Cell Sensing Inputs



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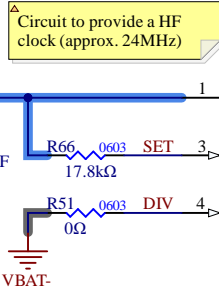
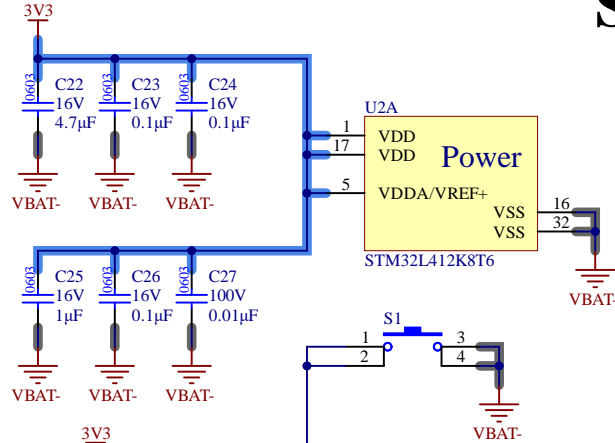
BALANCING FETS



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PROJECT LTO 16S BMS.PrjPcb, [No Variations]		
DOCUMENT Balancing_FETs.SchDoc		MODIFIED 2023-08-03
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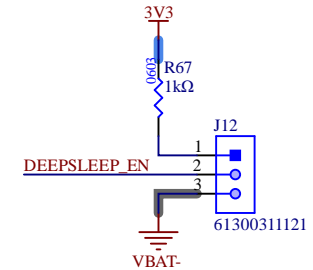
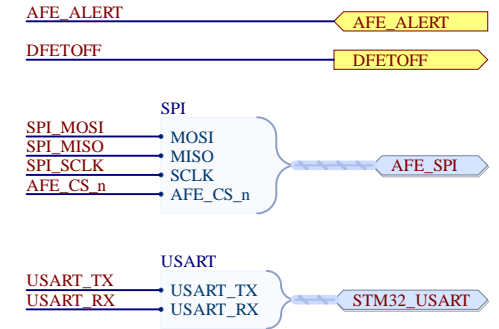
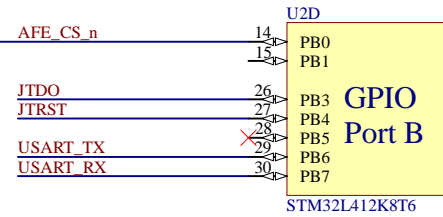
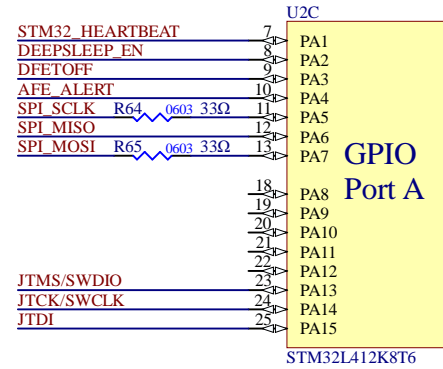
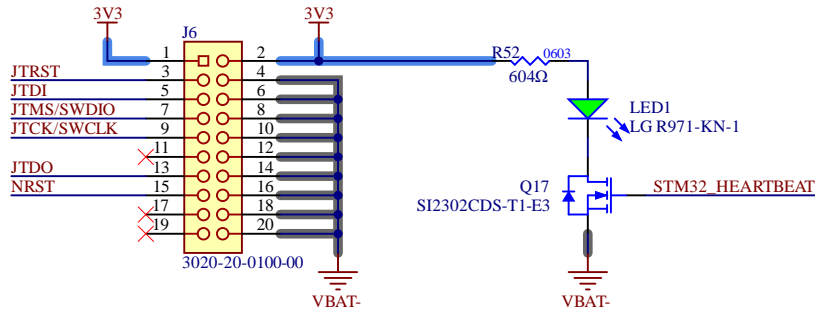
STM32 MCU

Follows reference design provided in https://www.st.com/resource/en/application_note/an4555-getting-started-with-stm32l4-series-and-stm32l4-series-hardware-development-stmicroelectronics.pdf (Figure 14), minor modifications made to fit selected package



Is this external oscillator needed? It consumes 4mA, which is quite a bit of power for the BMS that could be saved if the internal 16MHz or 48MHz oscillators will work, though I'm worried the lower stability of the internal oscillator will affect UART communication, would appreciate your input

Debug / Programming Connector

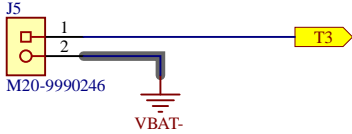
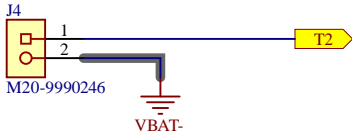
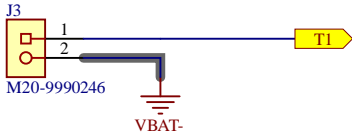


Header pins to connect to a toggle switch that will trigger STM32 to put AFE in DEEPSLEEP (very low current consumption) and also put STM32 in SHUTDOWN mode until switch is flipped to wake it back up

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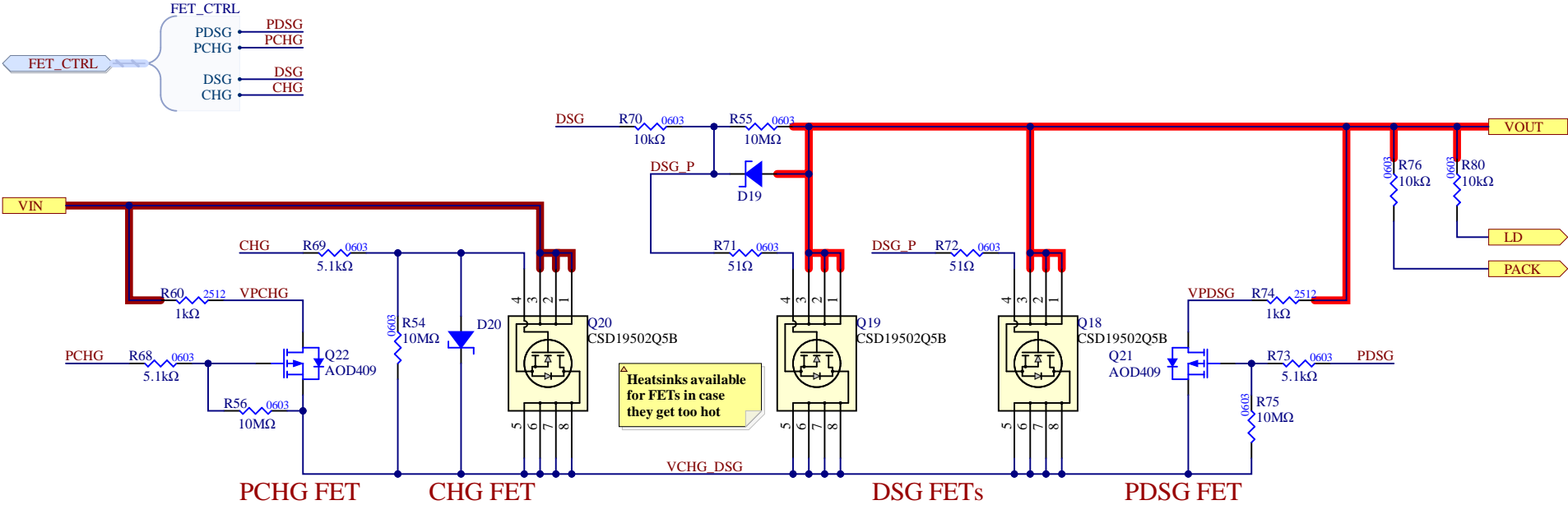
TEMPERATURE SENSING

103-AT thermistors to be connected here, will use 18k internal pull-up on AFE inputs



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PROJECT LTO 16S BMS.PrjPcb, [No Variations]		
DOCUMENT Temperature_Sense.SchDoc		MODIFIED 2023-07-29
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HIGH SIDE POWER FETS



Parallel DSG FETs configured based on TI app note:
https://www.ti.com/lit/an/slva952/slva952.pdf?ts=1690753454146&ref_url=https%253A%252F%252Fwww.google.com%252F

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PROJECT LTO 16S BMS.PrjPcb, [No Variations]		
DOCUMENT High_Side_FETs.SchDoc		MODIFIED 2023-08-03
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