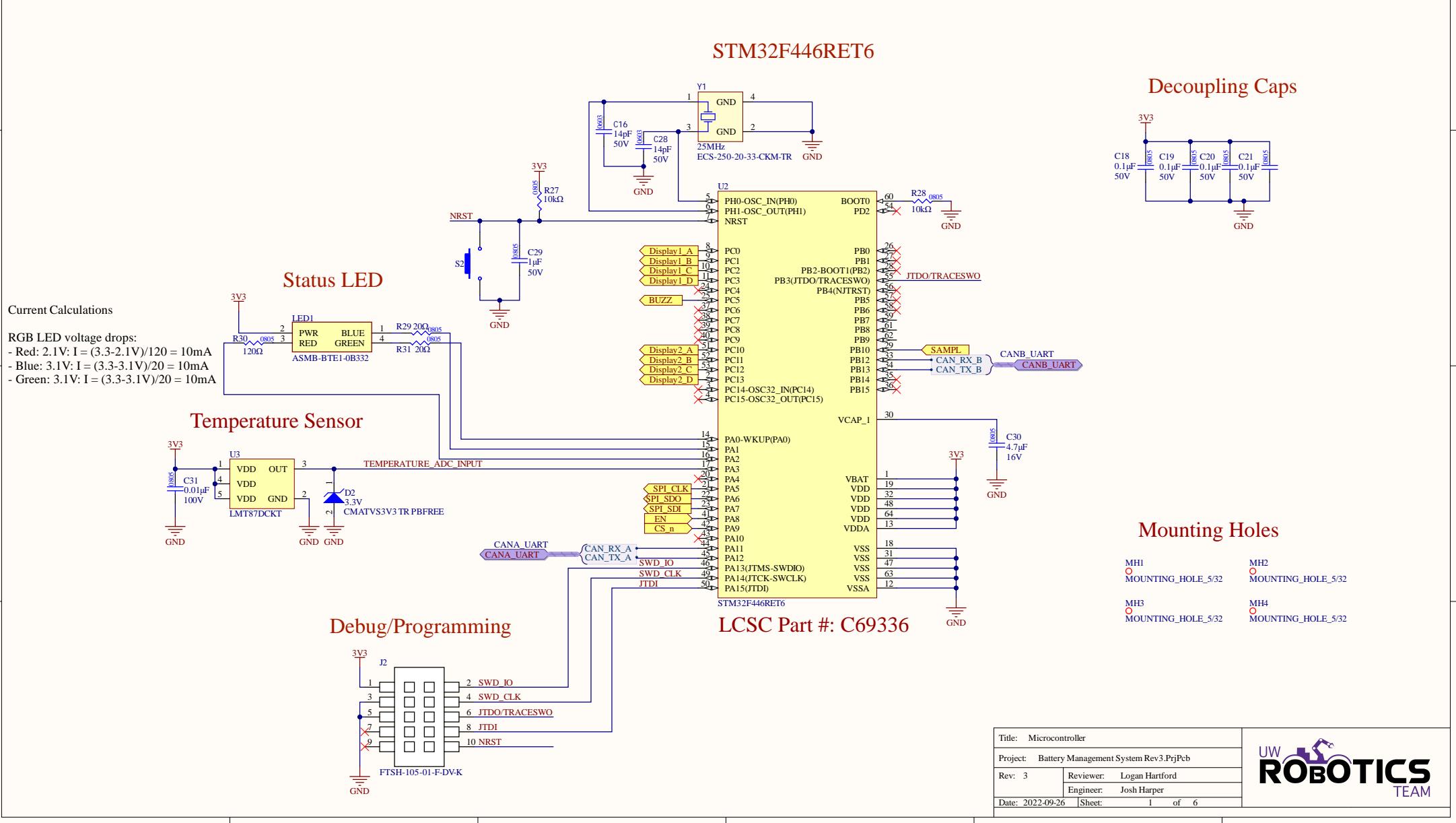


# Microcontroller

STM32F446RET6



|   |                          |
|---|--------------------------|
| Title: Microcontroller                        |                          |
| Project: Battery Management System Rev3.PjPcb |                          |
| Rev: 3  | Reviewer: Logan Hartford |
| Engineer: Josh Harper                         | Date: 2022-09-26         |

# BMS

## CUSTOM BATTERY CONNECTION



## BMS IC

Set EN to low to put device into shutdown and reset SPI registers

CV<sub>-</sub> voltages are tracked when SAMPL is high

3V3

50V  
0.1μF

GND

EN

CS

SPI\_CLK

SPI\_SDI

SPI\_SDO

SAMPL

VL

DGND

T3

T2

T1

AOUT

AGND

VA

LDOIN

VP

CV16

BA16

CT16

CB16

CV15

BA15

CT15

CB15

CV14

BA14

CT14

CB14

CV13

BA13

CT13

CB13

CV12

BA12

CT12

CB12

CV11

BA11

CT11

CB11

CV10

BA10

CT10

CB10

CV9

BA9

CT9

CB9

CV8

BA8

CT8

CB8

CV7

BA7

CT7

CB7

CV6

BA6

CT6

CB6

CV5

BA5

CT5

CB5

CV4

BA4

CT4

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CV2

BA2

CT2

CB2

CV1

BA1

CT1

CB1

CV0

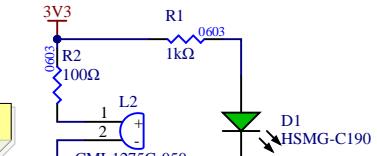
## BMS IC

U1 MAX14921ECS+

△ Buzzer min voltage drop: 3V  
I = (3.3V - 3V) / 100Ω = 30mA

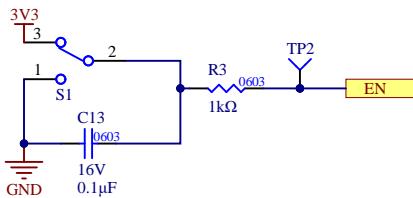
△ BUZZ

## BUZZER

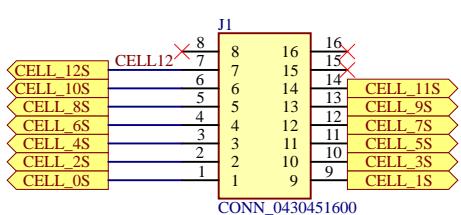


△ Green LED voltage drop: 2.2V  
- I = (3.3V - 2.2V) / (1kΩ) = 1.1mA

## RESET SWITCH



## BATTERY CONNECTOR



University of Waterloo Robotics Team  
200 University Ave W  
Waterloo, Ontario, Canada  
N2L 3G1

REV

3

PROJECT  
Battery Management System Rev3.PjrPcb, [No Variations]

DOCUMENT  
BMSRev3.SchDoc

MODIFIED

2022-09-27

ENGINEER  
Josh Harper

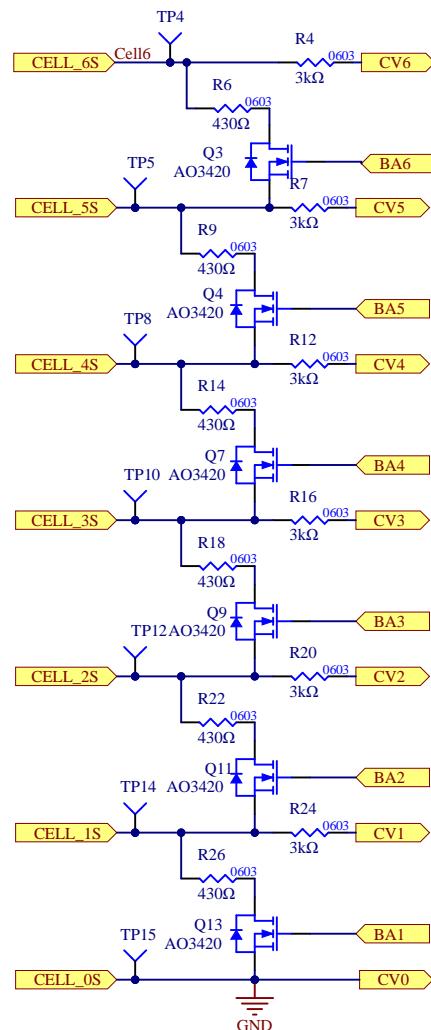
REVIEWER  
Farris Matar

SHEET

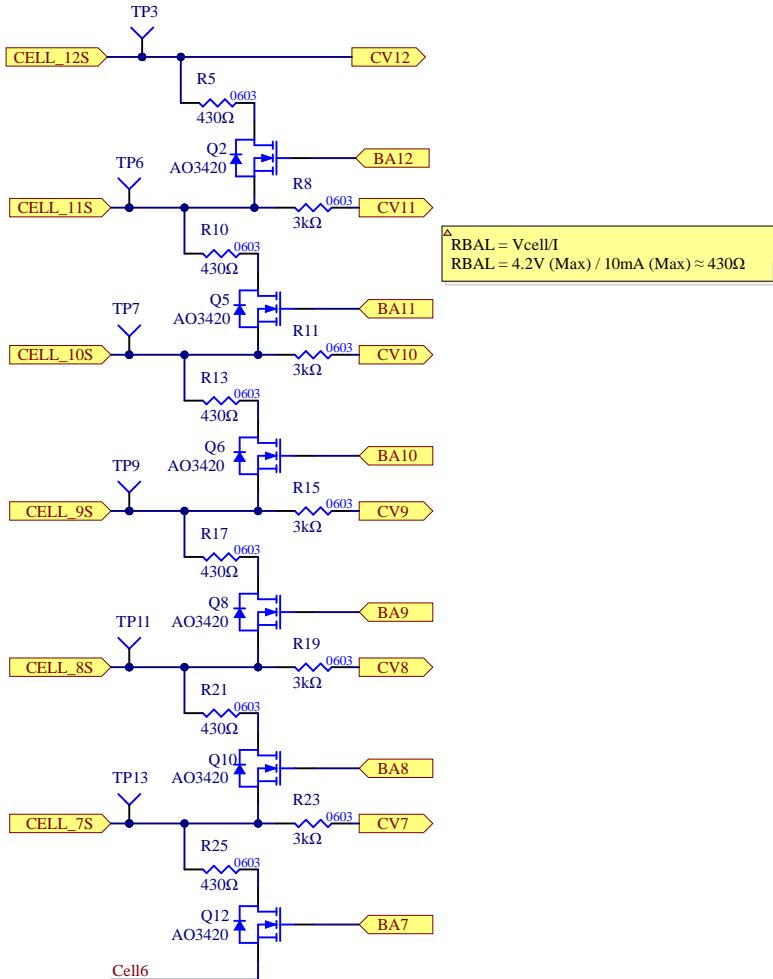
2 OF 6

# Passive Cell Balancing Circuit

A



B



C



PROJECT  
Battery Management System Rev3.PjrPcb, [No Variations]

DOCUMENT  
BatteryBalancingRev3.SchDoc

ENGINEER  
Josh Harper

REVIEWER  
\*

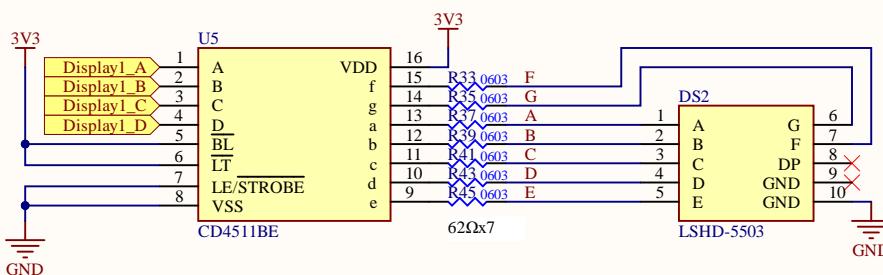
University of Waterloo Robotics Team  
200 University Ave W  
Waterloo, Ontario, Canada  
N2L 3G1

REV  
3

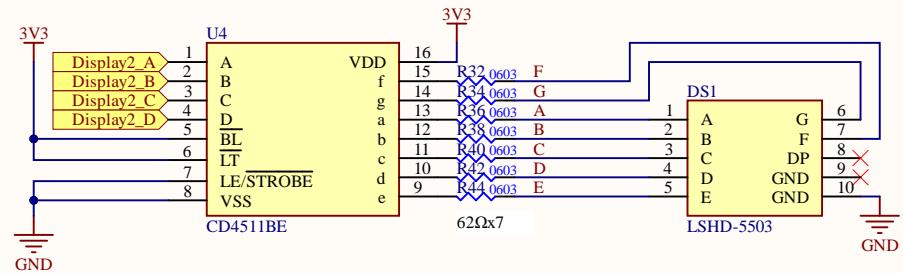
SHEET 3 OF 6

# Display

**DISPLAY 1**

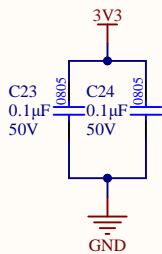


**DISPLAY 2**



△ Resistor Calculations  
(3.3V-2.1V)/20mA=60Ohms  
(62Ohm based on availability)

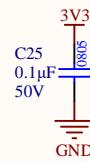
## Decoupling Caps



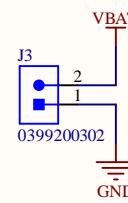
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|---------------------------------|----------|-----------|
| Size                            | Number   | Revision  |
| A4                              |          |           |
| Date: 9-26-2022                 | Sheet of |           |
| File: C:\Users\.\Display.SchDoc |          | Drawn By: |

# Power

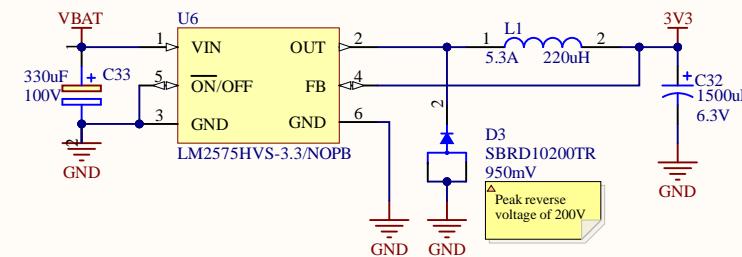
DECOUPLING CAP



POWER CONNECTOR



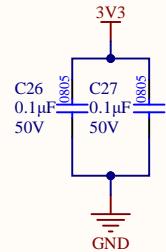
3.3V BUCK CONVERTER



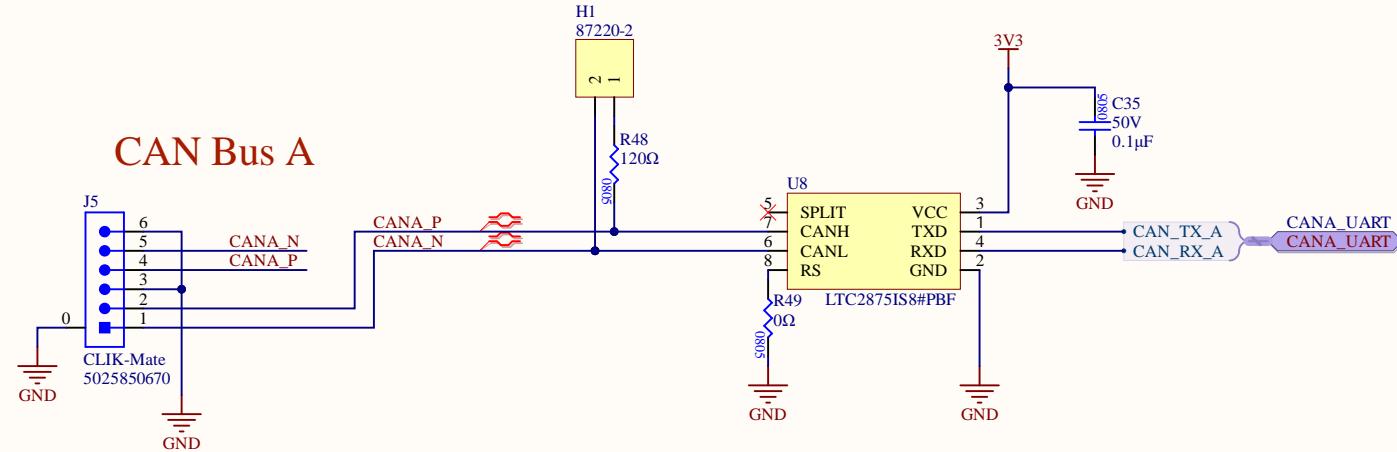
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|----------------|-------------------------------------|-----------------------|
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| A4             |                                     |                       |
| Date:<br>File: | 9-26-2022<br>C:\Users.\Power.SchDoc | Sheet of<br>Drawn By: |

# CAN Transceivers

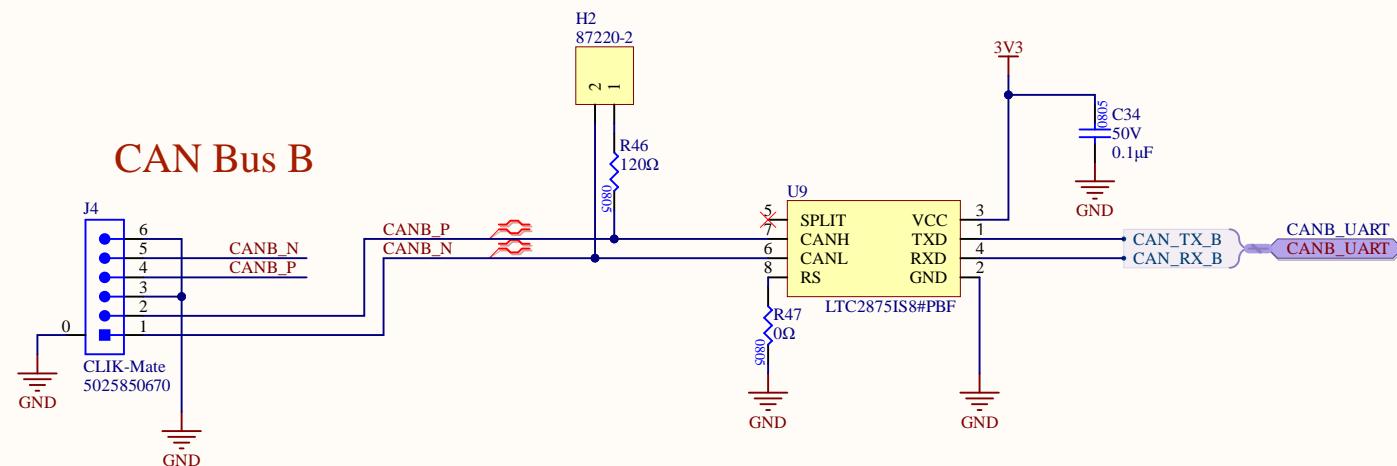
## Decoupling Caps



## CAN Bus A



## CAN Bus B



| Title                       |          |           |
|-----------------------------|----------|-----------|
| Size                        | Number   | Revision  |
| A4                          |          |           |
| Date: 9-26-2022             | Sheet of |           |
| File: C:\Users\.\CAN.SchDoc |          | Drawn By: |

