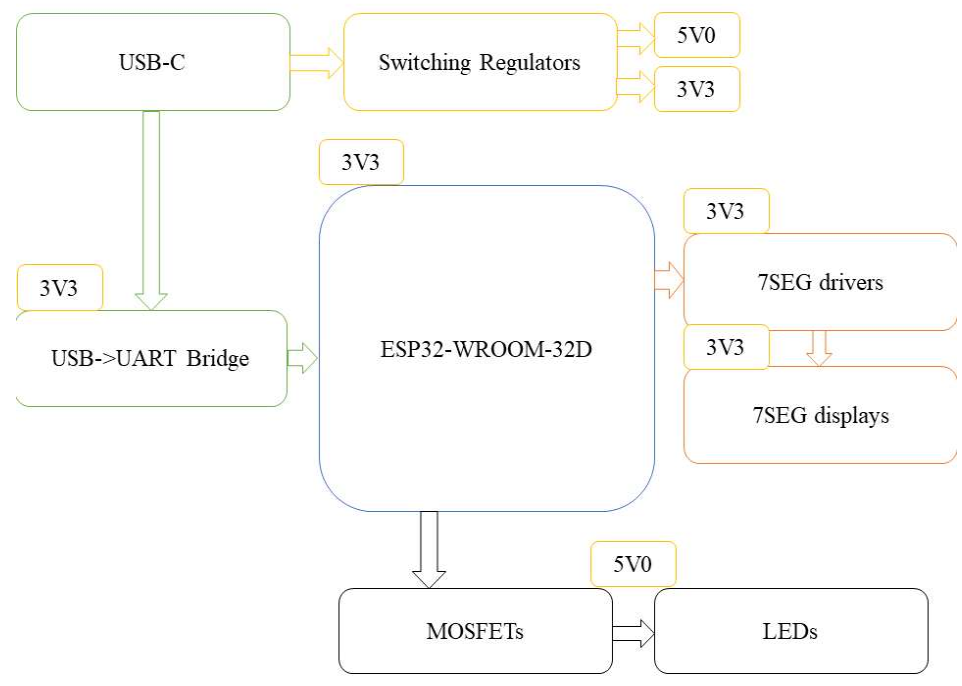
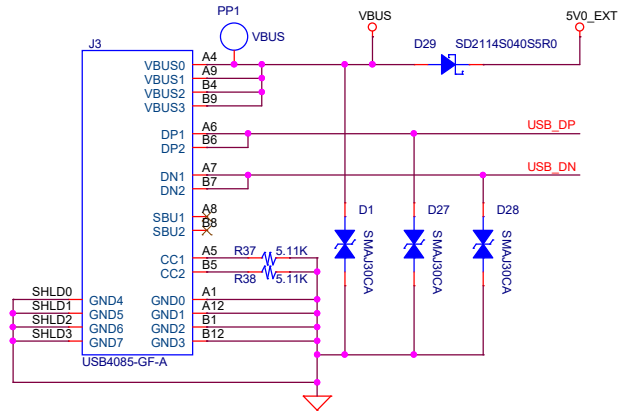


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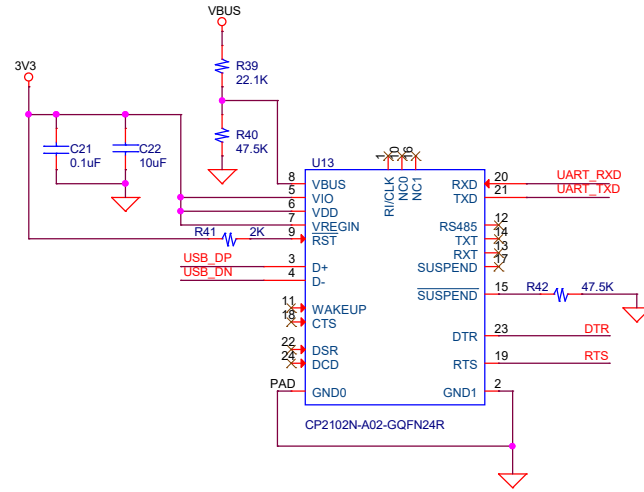


Zachary Ruhlen			
Title PreCommuter			
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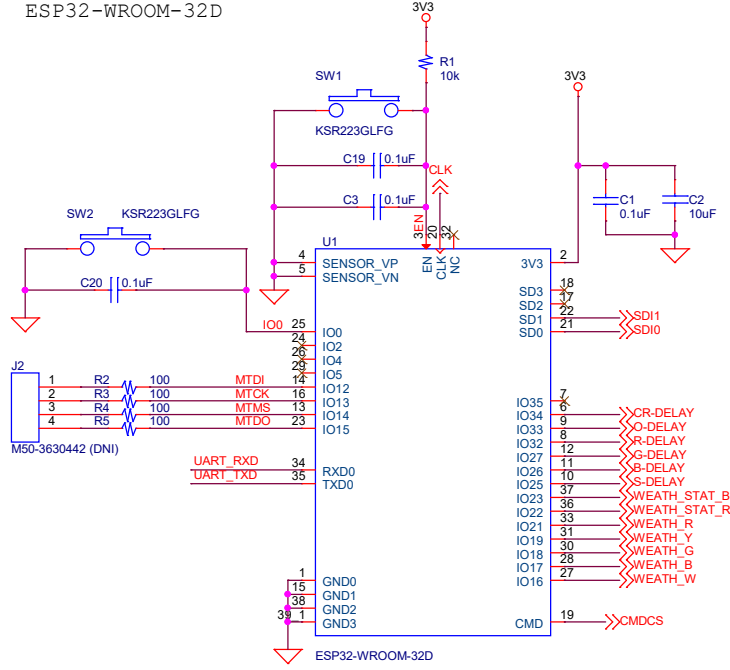
USB-C CONNECTION



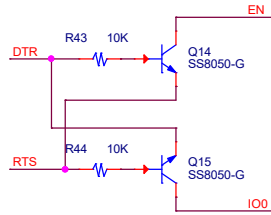
USB TO UART BRIDGE



ESP32-WROOM-32D



AUTO PROGRAM

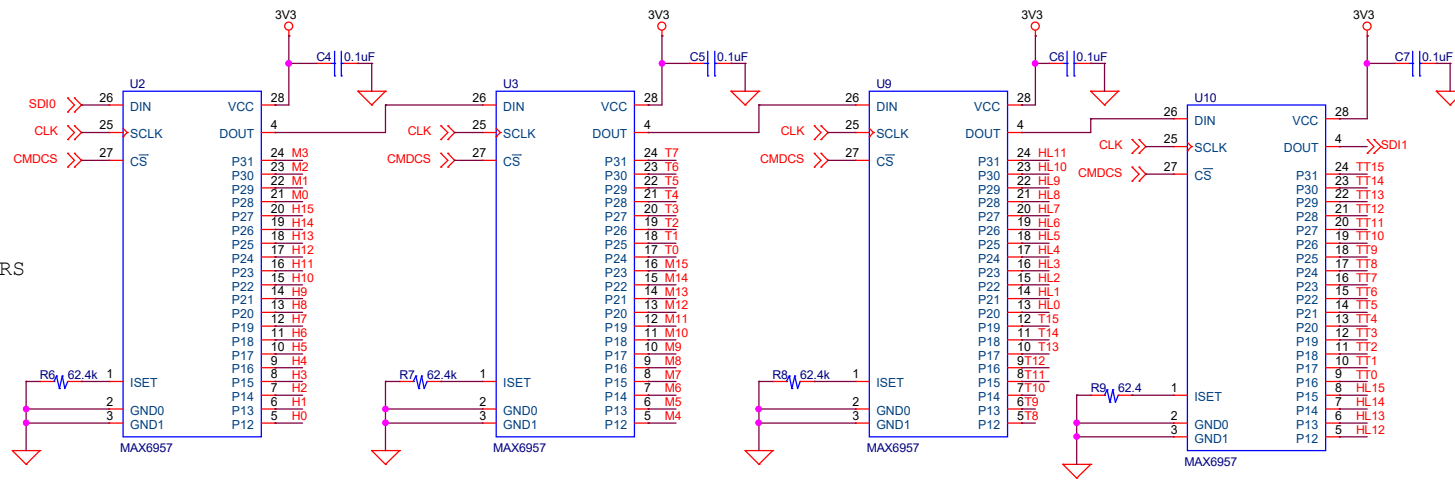


TRUTH TABLE

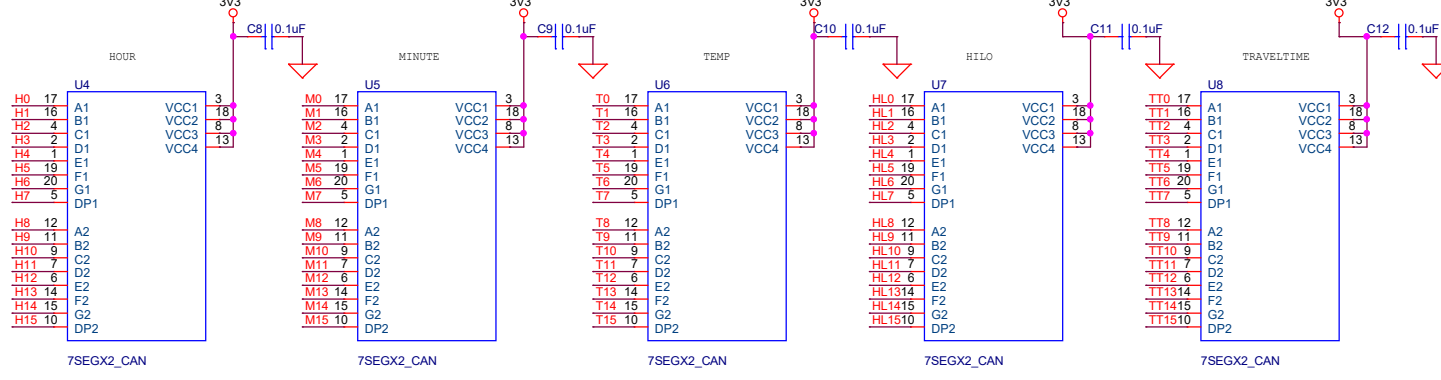
DTR	RTS	EN	IO0
1	1	1	1
0	0	1	1
1	0	0	1
0	1	1	0

Zachary Ruhlen		
Title 01 - USB INTERFACE, MICROPROC		
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7-SEG DISPLAY DRIVERS

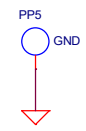
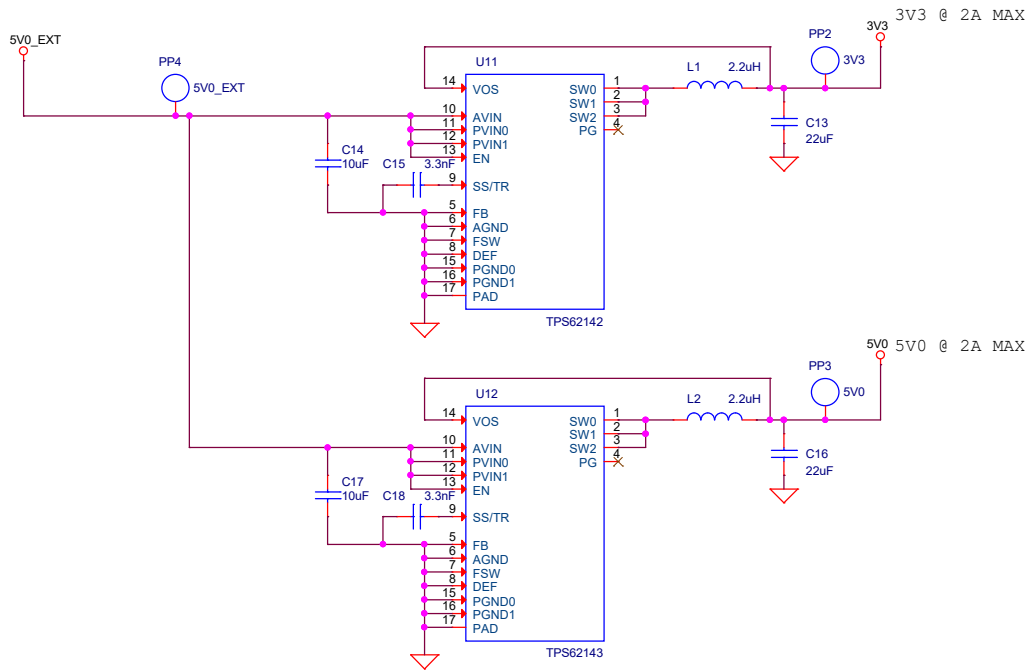


7-SEG DISPLAYS



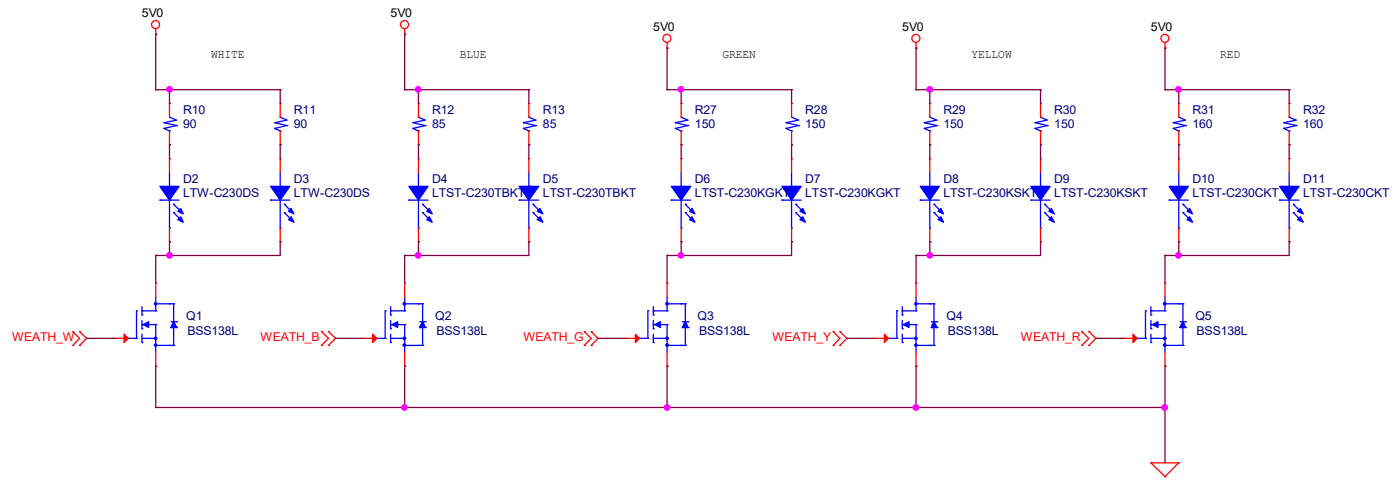
Zachary Ruhlen		
Title 02 - 7SEG		
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SWITCHING POWER REGULATORS

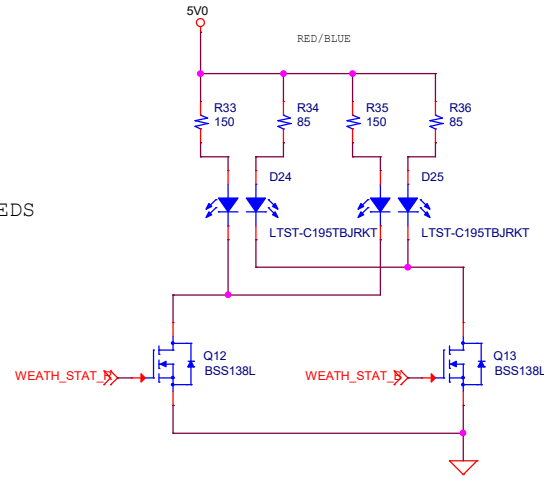


Zachary Ruhlen		
Title 05 - POWER		
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TEMPERATURE LEDS



WEATHER STATUS LEDS

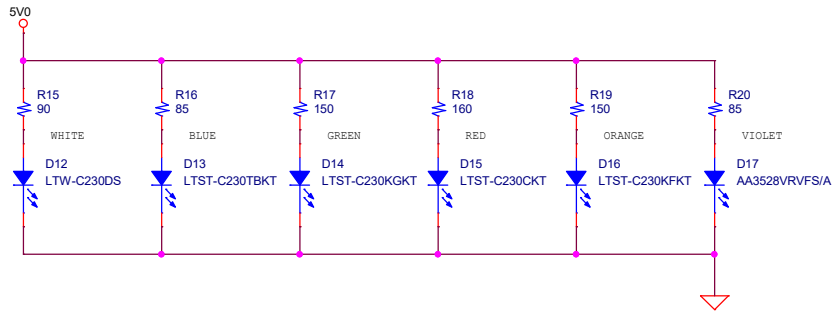


CURRENT LIMITING RESISTOR VALUES

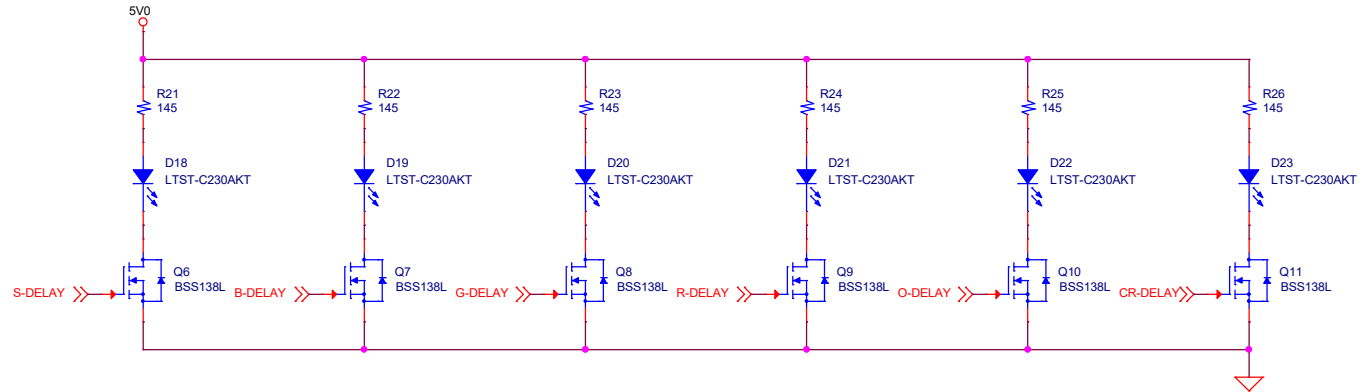
LED COLOR	VCC	Vf	Vres (VCC-Vf)	I(mA)	RESISTANCE (OHM)
WHITE	5	3.2	1.8	20	90
BLUE	5	3.3	1.7	20	85
GREEN	5	2.0	3	20	150
YELLOW	5	2.0	3	20	150
RED	5	1.8	3.2	20	160
RED W/BL	5	2.0	3	20	150
BLUE W/RD	5	3.3	1.7	20	85

Zachary Ruhien		
Title 03 - WEATHER LEDS		
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TRAIN LINE LEDS



TRAIN DELAY LEDS



CURRENT LIMITING RESISTOR VALUES

LED COLOR	VCC	Vf	Vres (VCC-Vf)	I(mA)	RESISTANCE (OHM)
WHITE	5	3.2	1.8	20	90
BLUE	5	3.3	1.7	20	85
GREEN	5	2.0	3	20	150
AMBER	5	2.1	2.9	20	145
RED	5	1.8	3.2	20	160
ORANGE	5	2.0	3	20	150
VIOLET	5	3.3	1.7	20	85

Zachary Ruhien		
Title 04 - MBTA LEDS		
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