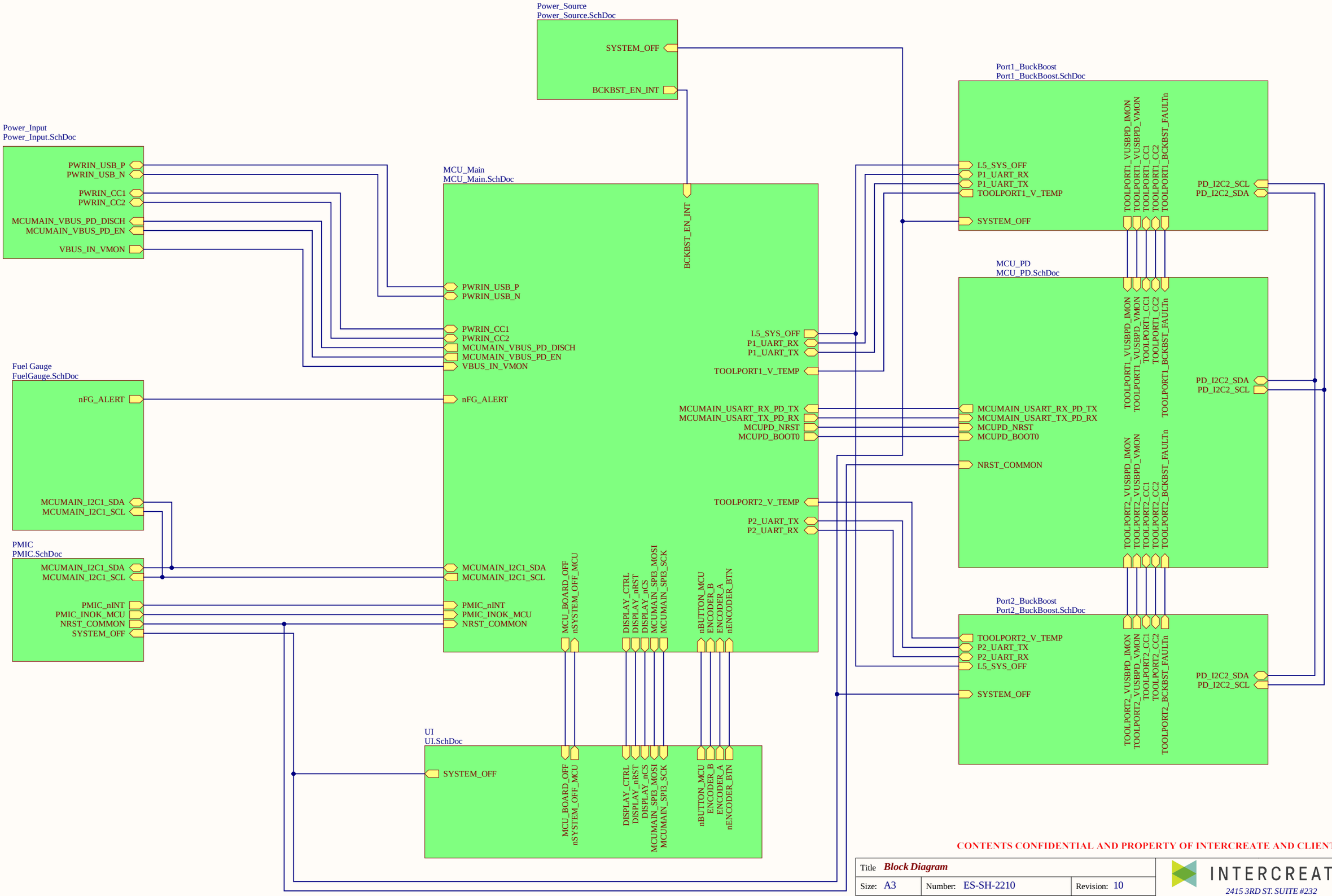

Title	***Block Diagram***		
Size: A3	Number: ES-SH-2210	Revision: 10	
Date: 6/7/2024	Time: 12:49:56 PM	Sheet 1 of 10	
File: Block_Diagram.SchDoc			

INTERCREATE
2415 3RD ST. SUITE #232
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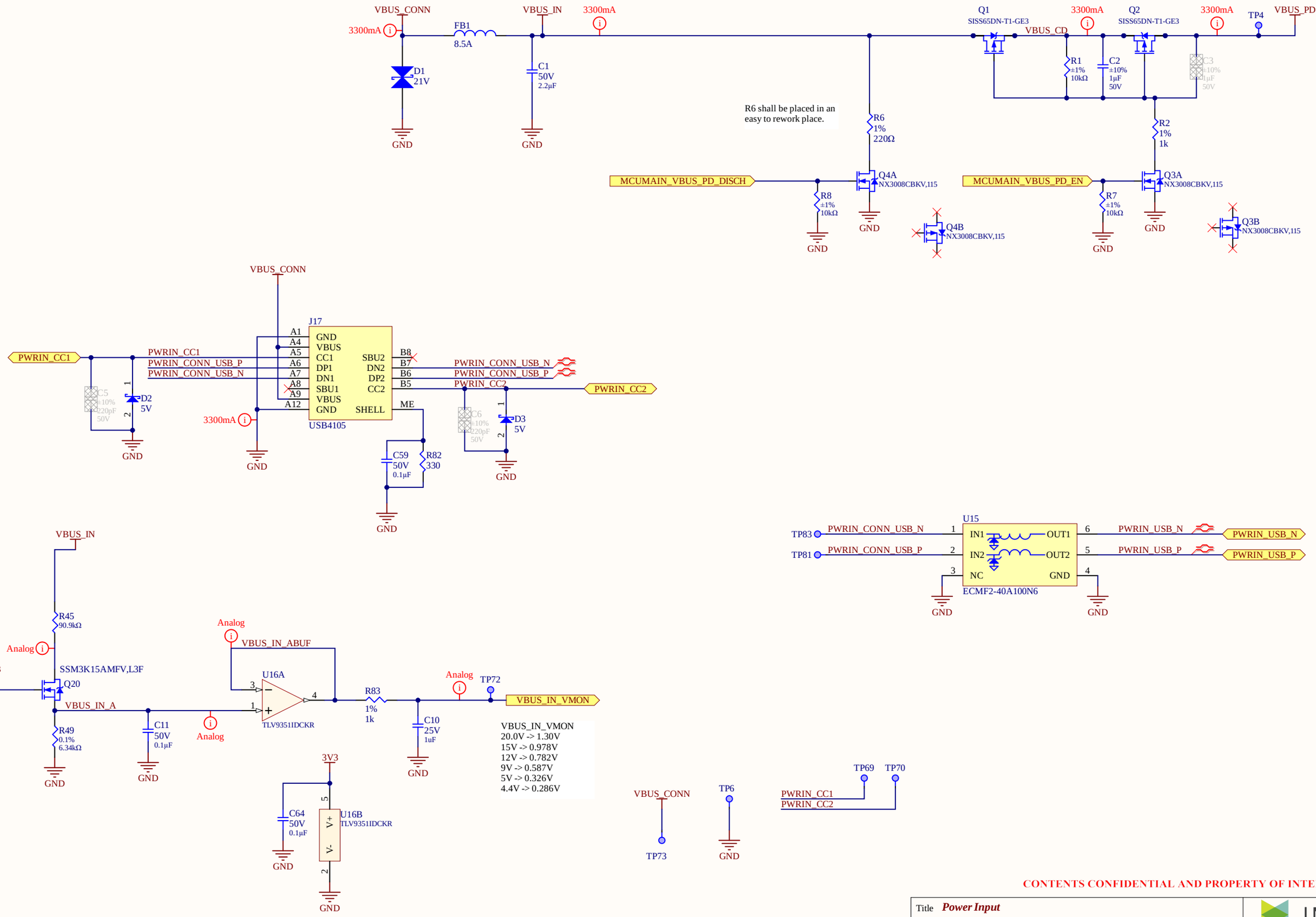

Title: *Power Input*		
Size: A3	Number: ES-SH-2210	Revision: 10
Date: 6/7/2024	Time: 12:49:57 PM	Sheet 2 of 10
File: Power_Input.SchDoc		

INTERCREATE
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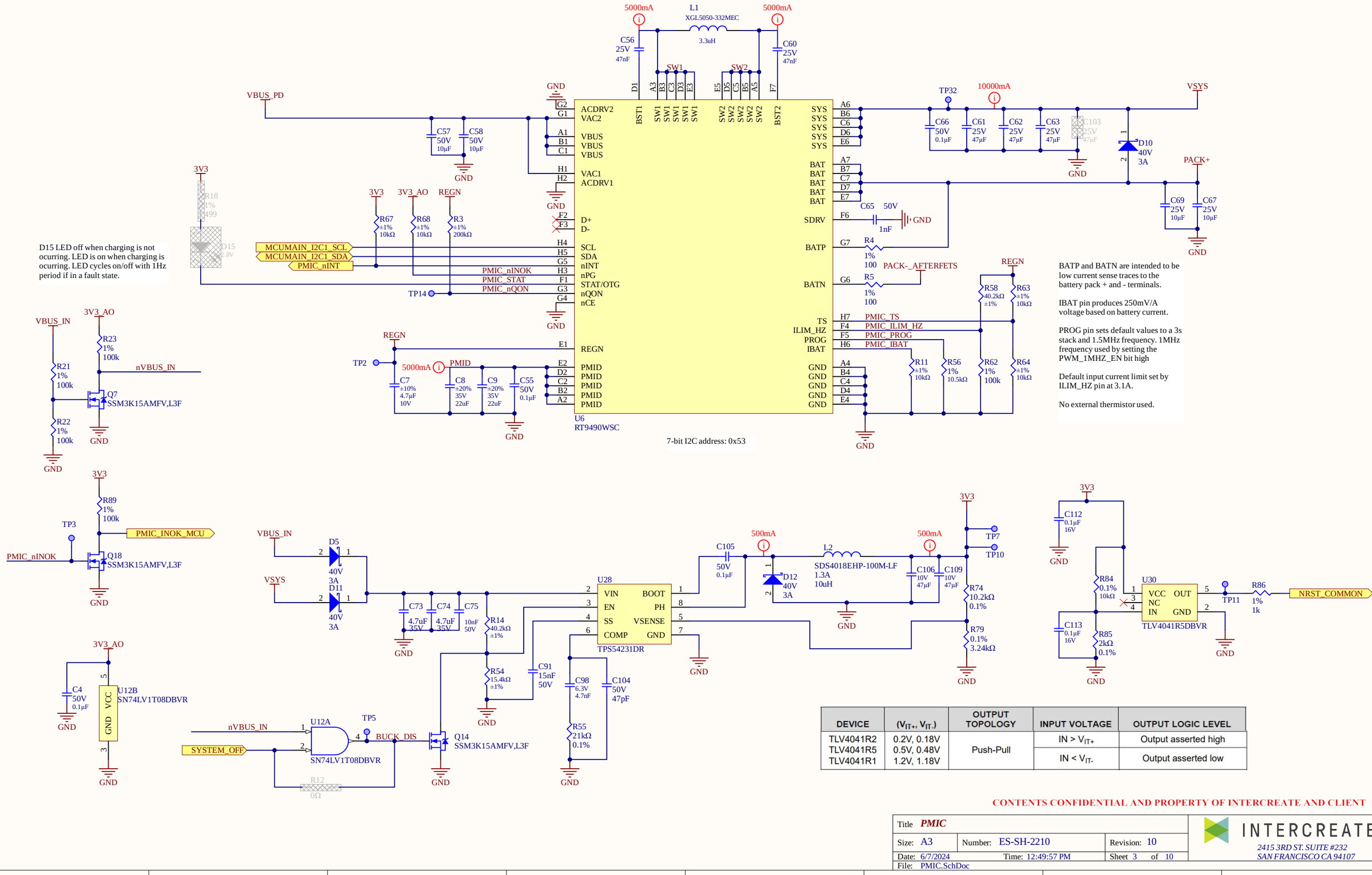

DEVICE	(V_{IT+}, V_{IT-})	OUTPUT TOPOLOGY	INPUT VOLTAGE	OUTPUT LOGIC LEVEL
TLV4041R2	0.2V, 0.18V	Push-Pull	IN > V_{IT+}	Output asserted high
TLV4041R5	0.5V, 0.48V		IN < V_{IT-}	Output asserted low
TLV4041R1	1.2V, 1.18V			

Title	*PMIC*		
Size: A3	Number: ES-SH-2210	Revision: 10	
Date: 6/7/2024	Time: 12:49:57 PM	Sheet 3 of 10	
File: PMIC.SchDoc			

INTERCREATE
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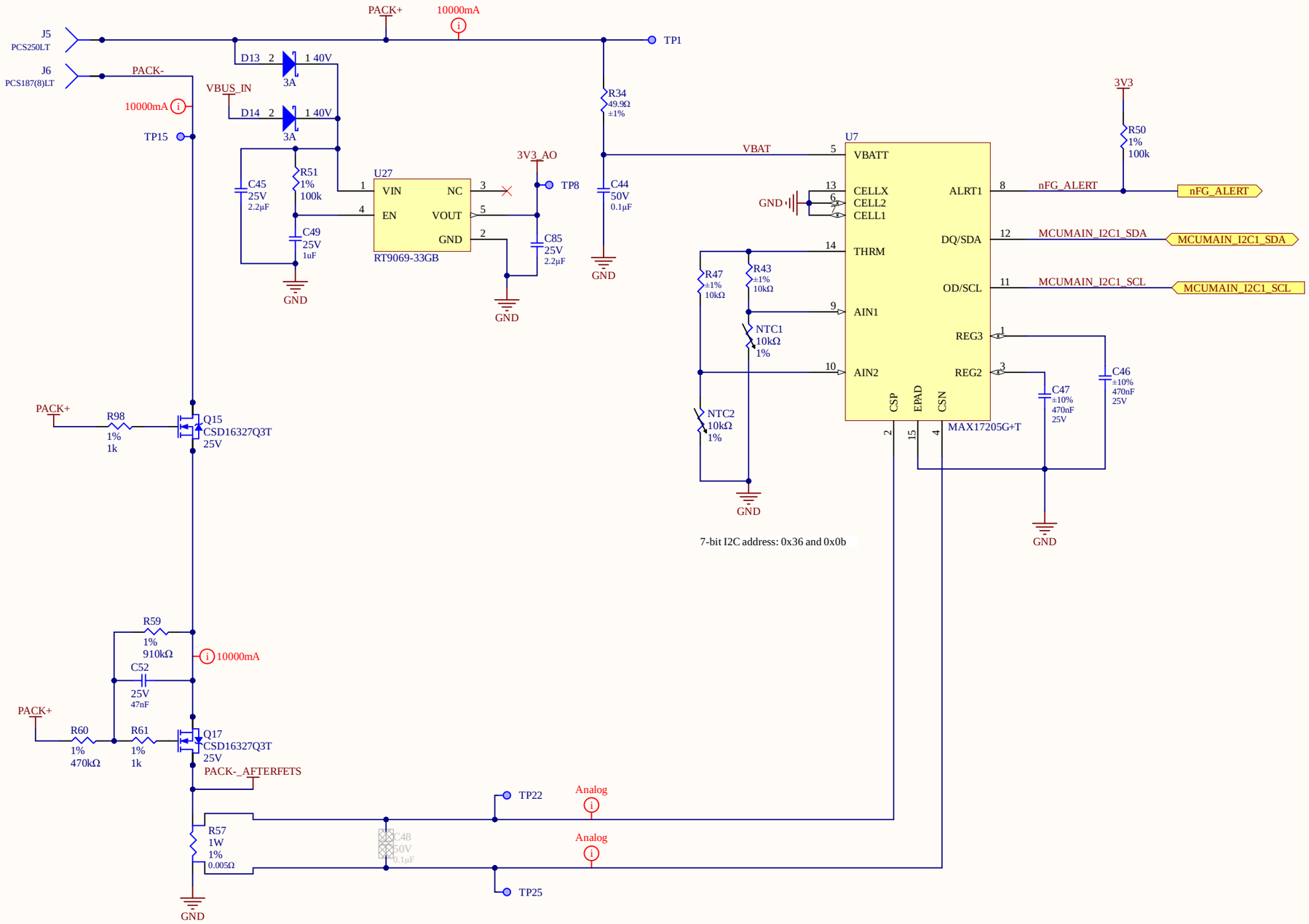

Title	*Fuel_Gauge*		
Size: A3	Number: ES-SH-2210	Revision: 10	
Date: 6/7/2024	Time: 12:49:57 PM	Sheet 4 of 10	
File: FuelGauge.SchDoc			

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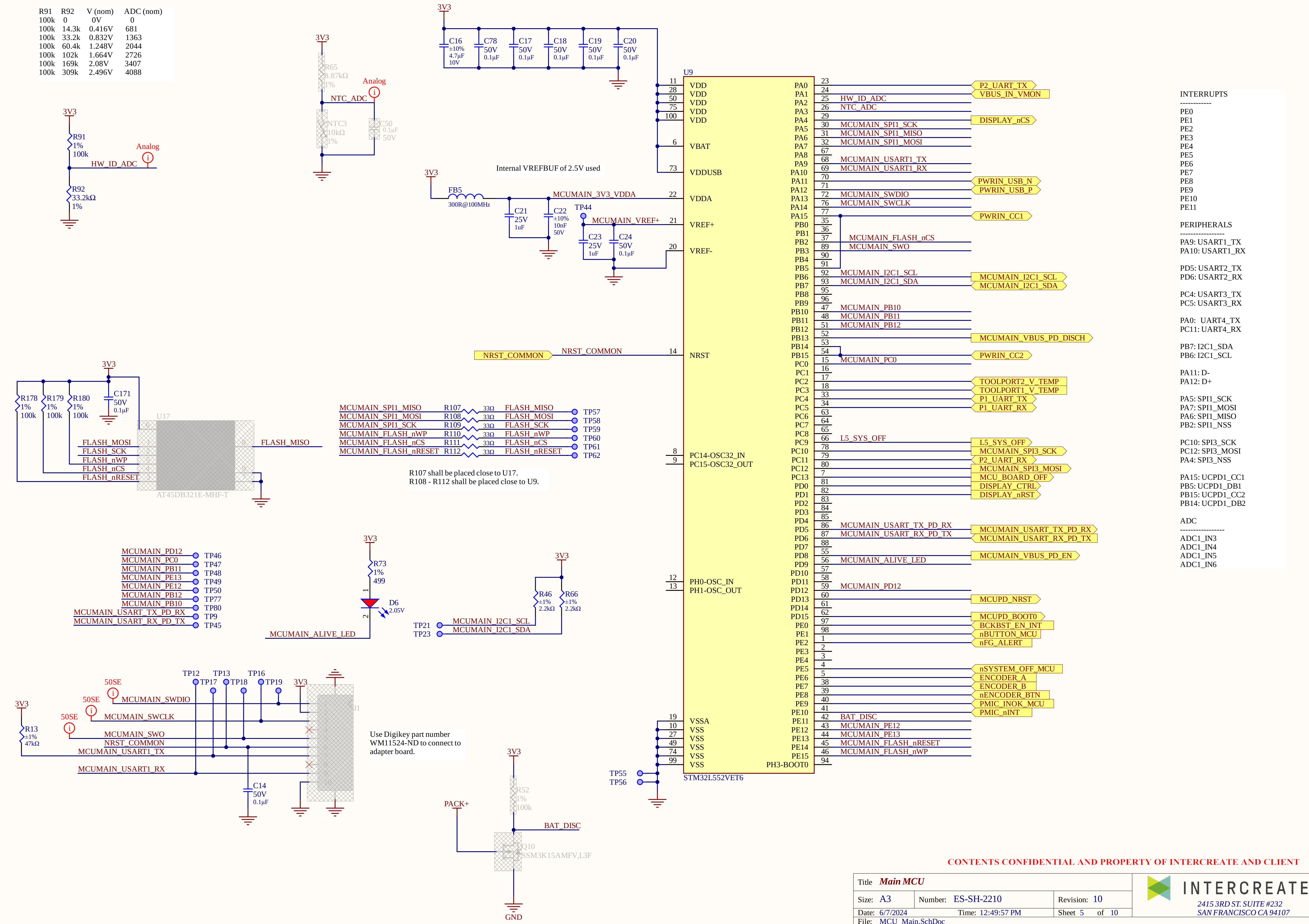
R91	R92	V (nom)	ADC (nom)
100k	0	0V	0
100k	14.3k	0.416V	681
100k	33.2k	0.832V	1363
100k	60.4k	1.248V	2044
100k	102k	1.664V	2726
100k	169k	2.08V	3407
100k	309k	2.496V	4088



3V3
R91 1% 100k
HW_ID_ADC
Analog
R92 33.2kΩ 1%
R65 8.87kΩ 1%
NTC_ADC
NTC3 10kΩ 1%
C50 0.1µF 50V
C16 ±10% 4.7µF 10V
C78 50V 0.1µF
C17 50V 0.1µF
C18 50V 0.1µF
C19 50V 0.1µF
C20 50V 0.1µF
Internal VREFBUF of 2.5V used
FB5 300R@100MHz
MCUMAIN_3V3_VDDA
C21 25V 1uF
C22 ±10% 10nF 50V
TP44
MCUMAIN_VREF+
C23 25V 1uF
C24 50V 0.1µF
U9
VDD
VBAT
VDDUSB
VDDA
VREF+
VREF-
NRST
PC14-OSC32_IN
PC15-OSC32_OUT
PH0-OSC_IN
PH1-OSC_OUT
VSSA
VSS
PH3-BOOT0
STM32L552VET6
NRST_COMMON
P2_UART_TX
VBUS_IN_VMON
HW_ID_ADC
NTC_ADC
DISPLAY_nCS
MCUMAIN_SPI1_SCK
MCUMAIN_SPI1_MISO
MCUMAIN_SPI1_MOSI
MCUMAIN_USART1_TX
MCUMAIN_USART1_RX
PWRIN_USB_N
PWRIN_USB_P
MCUMAIN_SWDIO
MCUMAIN_SWCLK
PWRIN_CC1
MCUMAIN_FLASH_nCS
MCUMAIN_SWO
MCUMAIN_I2C1_SCL
MCUMAIN_I2C1_SDA
MCUMAIN_PB10
MCUMAIN_PB11
MCUMAIN_PB12
MCUMAIN_VBUS_PD_DISCH
PWRIN_CC2
MCUMAIN_PC0
TOOLPORT2_V_TEMP
TOOLPORT1_V_TEMP
P1_UART_TX
P1_UART_RX
L5_SYS_OFF
MCUMAIN_SPI3_SCK
P2_UART_RX
MCUMAIN_SPI3_MOSI
MCU_BOARD_OFF
DISPLAY_CTRL
DISPLAY_nRST
MCUMAIN_USART_TX_PD_RX
MCUMAIN_USART_RX_PD_TX
MCUMAIN_VBUS_PD_EN
MCUMAIN_ALIVE_LED
MCUMAIN_PD12
MCUPD_NRST
MCUPD_BOOT0
BCKBST_EN_INT
nBUTTON_MCU
nFG_ALERT
nSYSTEM_OFF_MCU
ENCODER_A
ENCODER_B
nENCODER_BTN
PMIC_INOK_MCU
PMIC_nINT
BAT_DISC
MCUMAIN_PE12
MCUMAIN_PE13
MCUMAIN_FLASH_nRESET
MCUMAIN_FLASH_nWP
TP55
TP56
R178 1% 100k
R179 1% 100k
R180 1% 100k
C171 50V 0.1µF
U17
FLASH_MOSI
FLASH_SCK
FLASH_nWP
FLASH_nCS
FLASH_nRESET
FLASH_MISO
AT45DB321E-MHF-T
R107 33Ω
R108 33Ω
R109 33Ω
R110 33Ω
R111 33Ω
R112 33Ω
TP57
TP58
TP59
TP60
TP61
TP62
R107 shall be placed close to U17.
R108 - R112 shall be placed close to U9.
TP46
TP47
TP48
TP49
TP50
TP77
TP80
TP9
TP45
R73 1% 499
D6 2.05V
R46 ±1% 2.2kΩ
R66 ±1% 2.2kΩ
TP21
TP23
50SE
R13 ±1% 47kΩ
TP12
TP13
TP16
TP17
TP18
TP19
J1
C14 50V 0.1µF
Use Digikey part number WM11524-ND to connect to adapter board.
PACK+
R52 1% 100k
Q10 SSM3K15AMFV,L3F
GND

INTERRUPTS

PE0
PE1
PE2
PE3
PE4
PE5
PE6
PE7
PE8
PE9
PE10
PE11

PERIPHERALS

PA9: USART1_TX
PA10: USART1_RX

PD5: USART2_TX
PD6: USART2_RX

PC4: USART3_TX
PC5: USART3_RX

PA0: UART4_TX
PC11: UART4_RX

PB7: I2C1_SDA
PB6: I2C1_SCL

PA11: D-
PA12: D+

PA5: SPI1_SCK
PA7: SPI1_MOSI
PA6: SPI1_MISO
PB2: SPI1_NSS

PC10: SPI3_SCK
PC12: SPI3_MOSI
PA4: SPI3_NSS

PA15: UCPD1_CC1
PB5: UCPD1_DB1
PB15: UCPD1_CC2
PB14: UCPD1_DB2

ADC

ADC1_IN3
ADC1_IN4
ADC1_IN5
ADC1_IN6

Title: *Main MCU*
Size: A3 | Number: ES-SH-2210 | Revision: 10
Date: 6/7/2024 | Time: 12:49:57 PM | Sheet 5 of 10
File: MCU_Main.SchDoc

INTERCREATE
2415 3RD ST. SUITE #232
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INTERRUPTS

PC14
PC15

PERIPHERALS

PA0: USART4_TX
PA1: USART4_RX

PA2: USART2_TX
PA3: USART2_RX

PA5: USART3_TX
PB0: USART3_RX

PB6: USART1_TX
PB7: USART1_RX

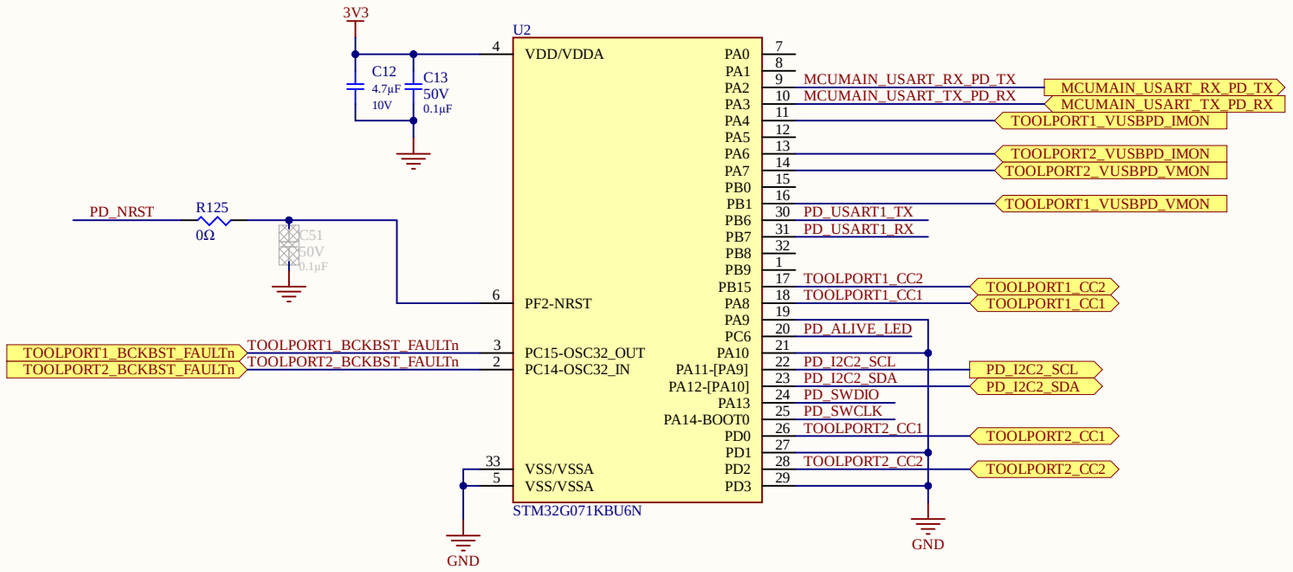
PA11: I2C2_SCL
PA12: I2C2_SDA

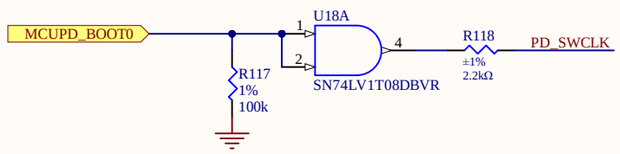
PB15: USBPD1 CC2
PA8: USBPD1 CC1
PD2: USBPD2 CC2
PD0: USBPD2 CC1

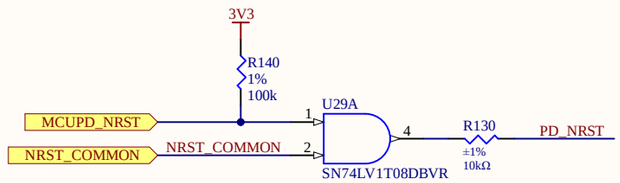
PA9: USBPD1 DBCC1
PA10: USBPD1 DBCC2
PD1: USBPD2 DBCC1
PD3: USBPD2 DBCC2

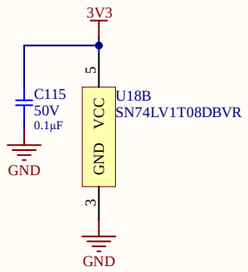
ADC

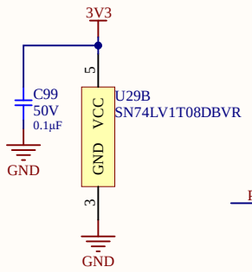
PA4: ADC1_IN4
PA6: ADC1_IN6
PA7: ADC1_IN7
PB1: ADC1_IN9

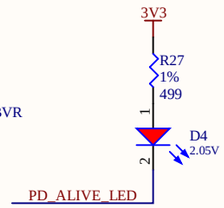


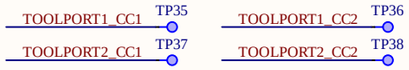


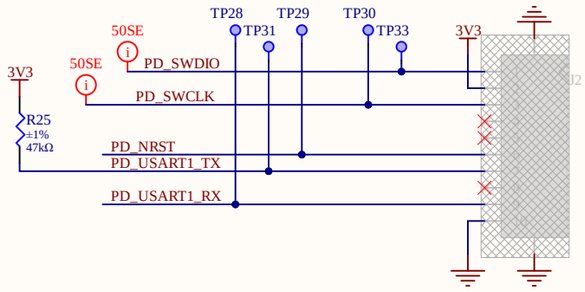




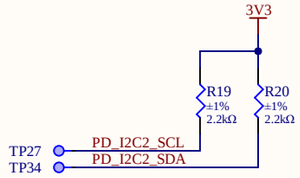








Use Digikey part number WM11524-ND to connect to adapter board.



Title	***PD MCU***		
Size: A3	Number: ES-SH-2210		Revision: 10
Date: 6/7/2024	Time: 12:49:58 PM		Sheet 6 of 10
File: MCU_PD.SchDoc			

INTERCREATE
2415 3RD ST. SUITE #232
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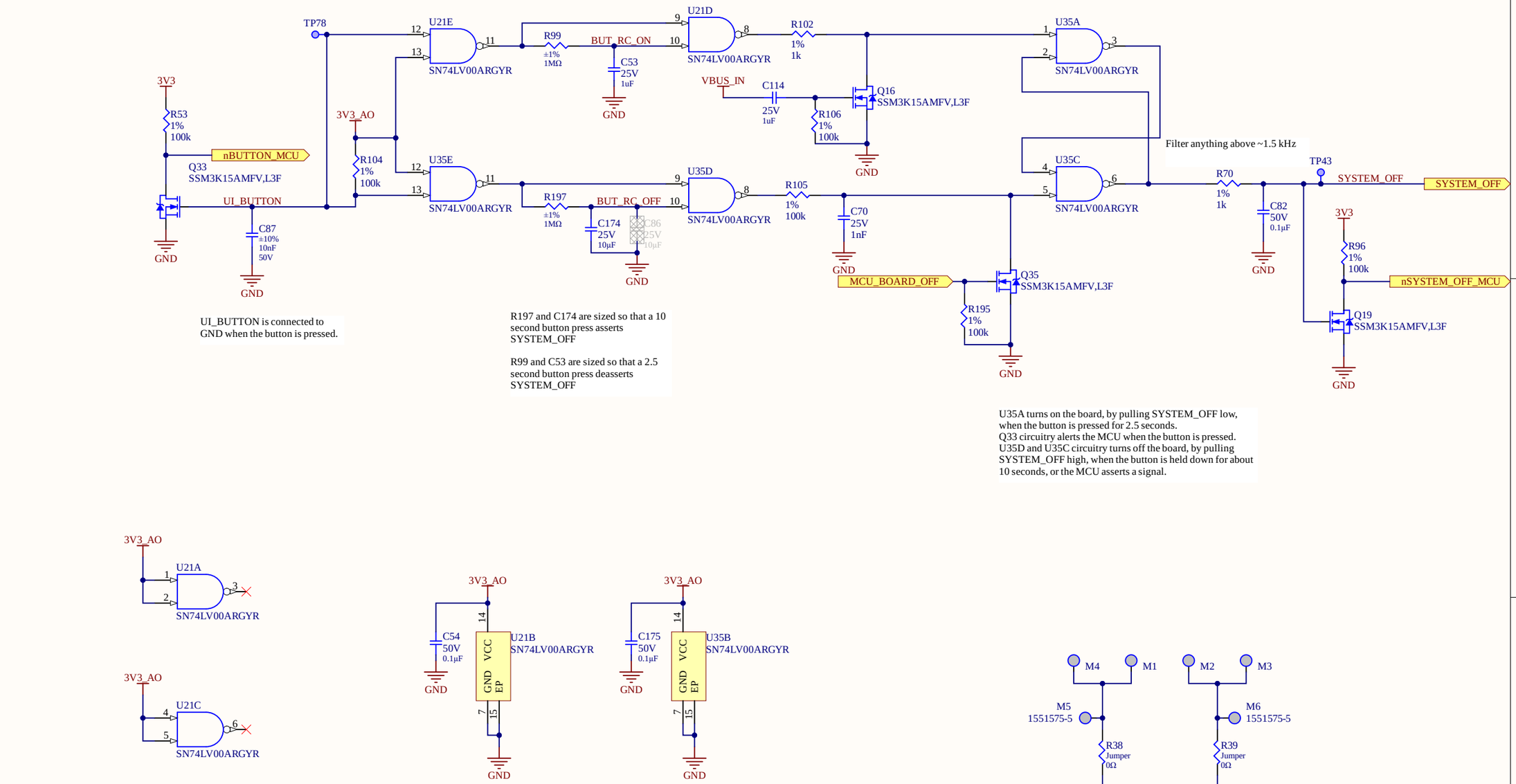

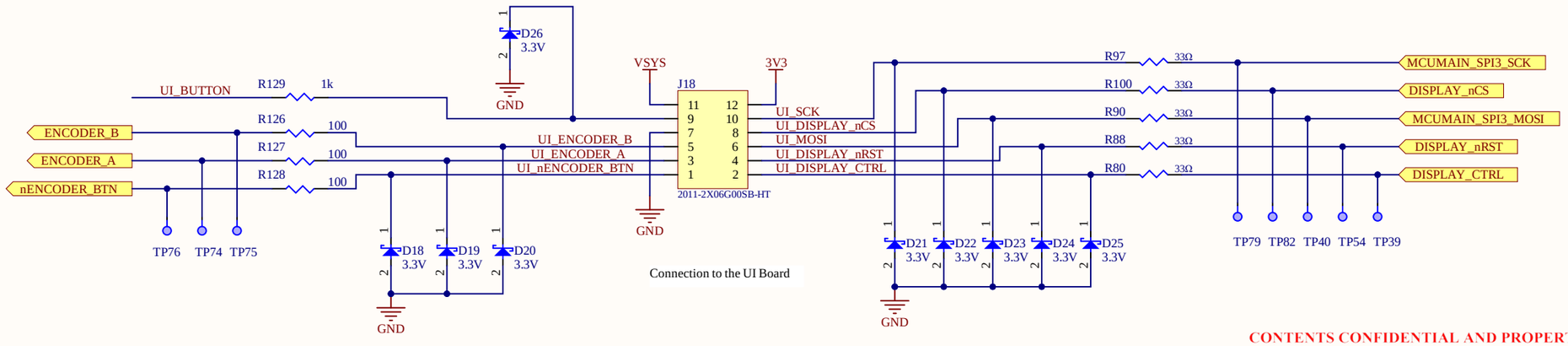

Title *UI*			
Size: A3	Number: ES-SH-2210		Revision: 10
Date: 6/7/2024	Time: 12:49:58 PM		Sheet 7 of 10
File: UI.SchDoc			

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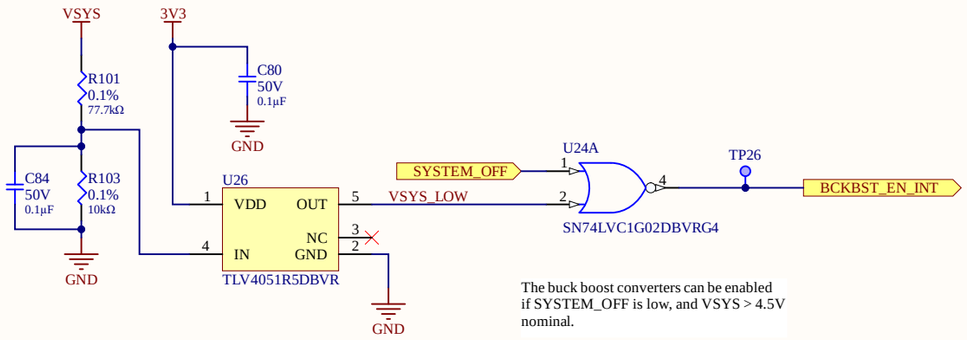
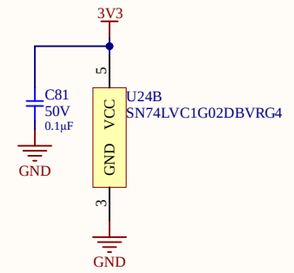
TLV4051 has a built in reference of 0.5V nominal and has an inverting push-pull output (when voltage at the IN pin is below the reference voltage, the output is high).

DEVICE	(V_{IT+}, V_{IT-})	OUTPUT TOPOLOGY	INPUT VOLTAGE	OUTPUT LOGIC LEVEL
TLV4051R2	0.2V, 0.18V	Push-Pull	IN > V_{IT+}	Output asserted low
TLV4051R5	0.5V, 0.48V		IN < V_{IT-}	Output asserted high
TLV4051R1	1.2V, 1.18V			



The buck boost converters can be enabled if SYSTEM_OFF is low, and VSYS > 4.5V nominal.



Title	*Power Source*		
Size: A3	Number: ES-SH-2210		Revision: 10
Date: 6/7/2024	Time: 12:49:58 PM		Sheet 8 of 10
File: Power_Source.SchDoc			

INTERCREATE
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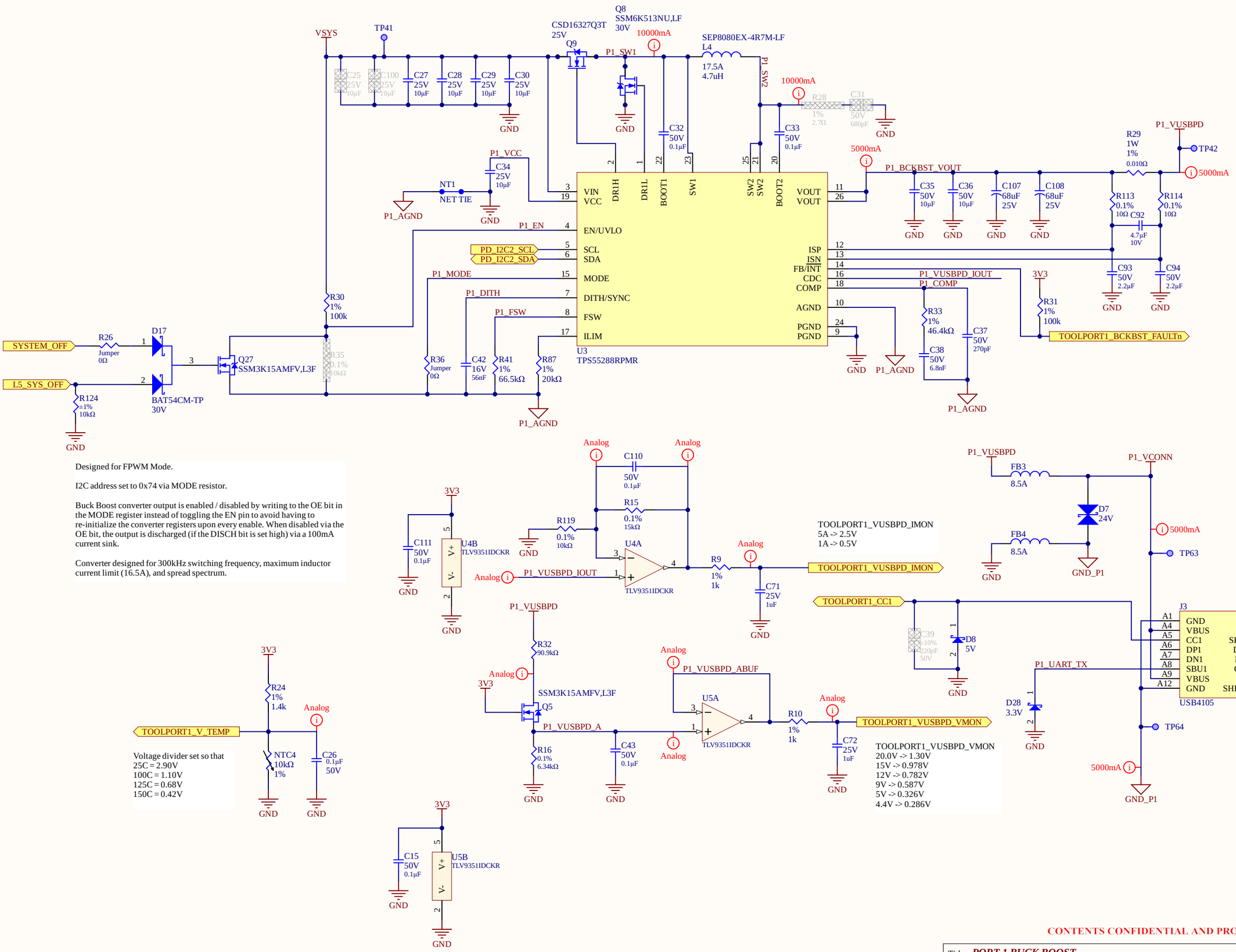

Designed for FPWM Mode.

I2C address set to 0x74 via MODE resistor.

Buck Boost converter output is enabled / disabled by writing to the OE bit in the MODE register instead of toggling the EN pin to avoid having to re-initialize the converter registers upon every enable. When disabled via the OE bit, the output is discharged (if the DISCH bit is set high) via a 100mA current sink.

Converter designed for 300kHz switching frequency, maximum inductor current limit (16.5A), and spread spectrum.

Title	*PORT 1 BUCK BOOST*		
Size: A3	Number: ES-SH-2210	Revision: 10	
Date: 6/7/2024	Time: 12:49:59 PM	Sheet 9 of 10	
File: Port1_BuckBoost.SchDoc			

INTERCREATE
2415 3RD ST. SUITE #232
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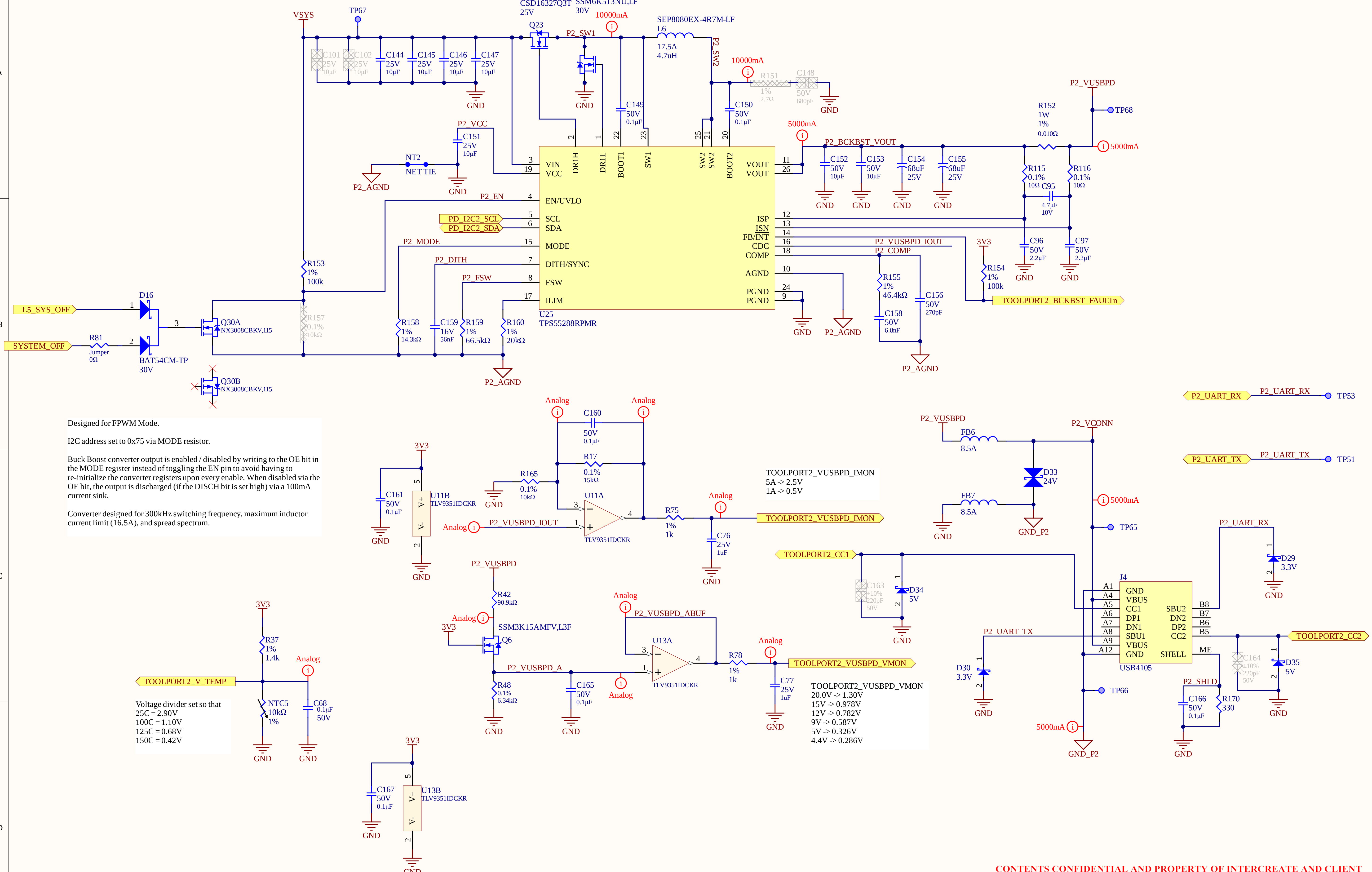

Designed for FPWM Mode.

I2C address set to 0x75 via MODE resistor.

Buck Boost converter output is enabled / disabled by writing to the OE bit in the MODE register instead of toggling the EN pin to avoid having to re-initialize the converter registers upon every enable. When disabled via the OE bit, the output is discharged (if the DISCH bit is set high) via a 100mA current sink.

Converter designed for 300kHz switching frequency, maximum inductor current limit (16.5A), and spread spectrum.

TOOLPORT2_VUSBPD_IMON
5A -> 2.5V
1A -> 0.5V

Voltage divider set so that
25C = 2.90V
100C = 1.10V
125C = 0.68V
150C = 0.42V

TOOLPORT2_VUSBPD_VMON
20.0V -> 1.30V
15V -> 0.978V
12V -> 0.782V
9V -> 0.587V
5V -> 0.326V
4.4V -> 0.286V

Title: PORT 2 BUCK BOOST		
Size: A3	Number: ES-SH-2210	Revision: 10
Date: 6/7/2024	Time: 12:49:59 PM	Sheet 10 of 10
File: Port2_BuckBoost.SchDoc		

INTERCREATE
2415 3RD ST. SUITE #232
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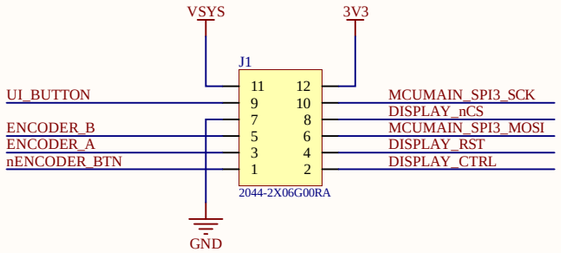
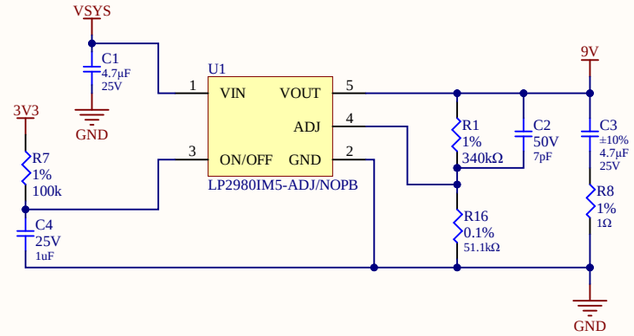
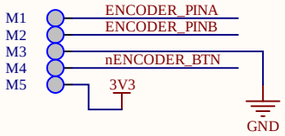
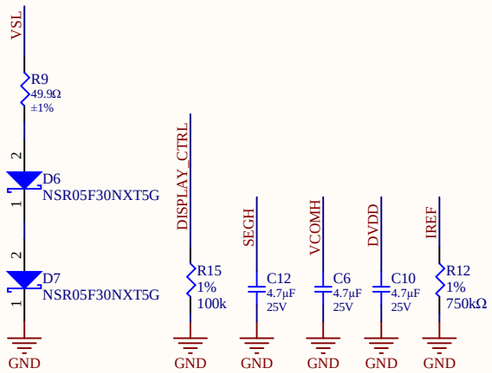
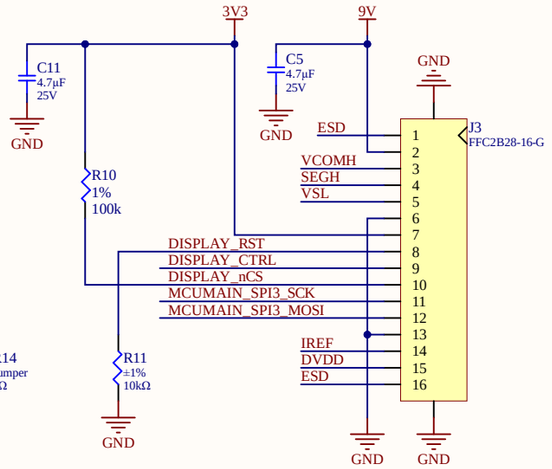




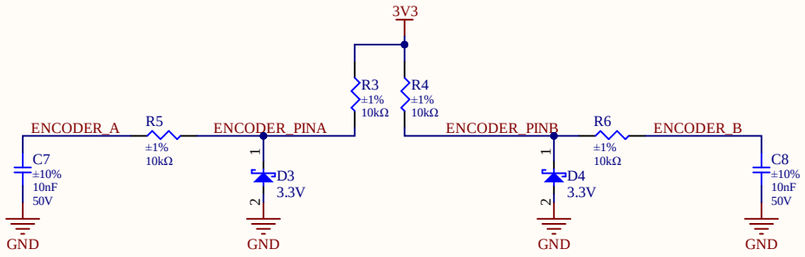
9V nominal voltage is designed for 8.84V

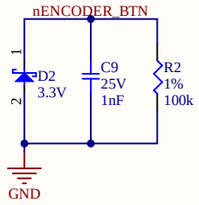






PIN	SYNBOL
1	ESD_GND
2	VPP
3	VCOMH
4	SEGH
5	VSL
6	VSS
7	VDD
8	RES
9	A0/SA0
10	CS
11	SCL
12	SI
13	VSS_IM1
14	IREF
15	DVDD
16	ESD_GND





Title *UI*		
Size: A3	Number: ES-SH-2226	Revision: 4
Date: 9/1/2023	Time: 4:43:36 PM	Sheet 1 of 1
File: UI.SchDoc		

INTERCREATE
2415 3RD ST. SUITE #232
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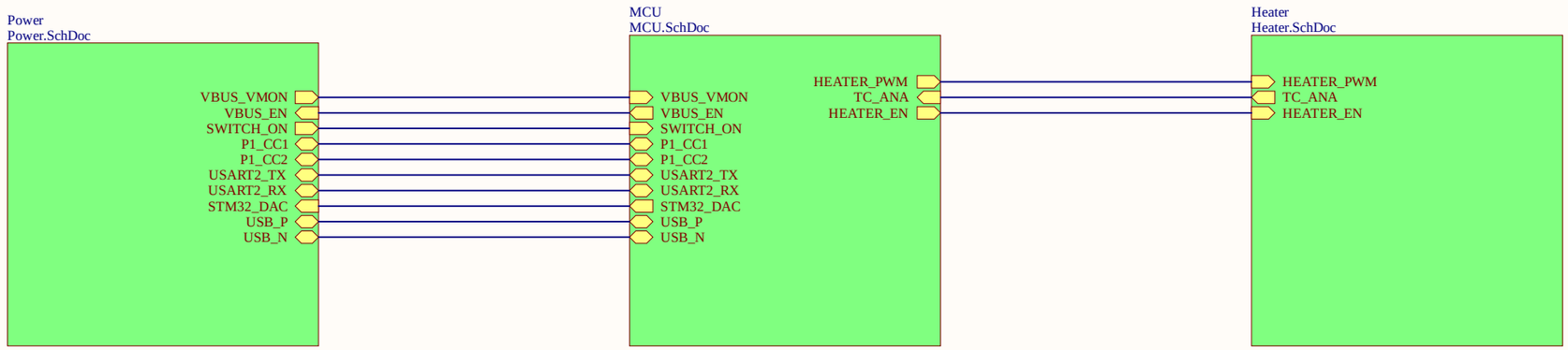

Title	***Block Diagram***		
Size: A3	Number: ES-SI-2100	Revision: 15	
Date: 6/7/2024	Time: 12:59:07 PM	Sheet 1 of 4	
File: Block_Diagram.SchDoc			

INTERCREATE
2325 3RD ST. SUITE #204
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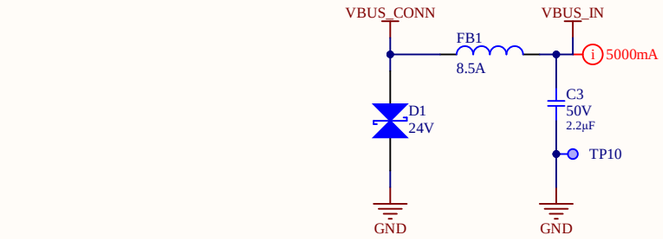

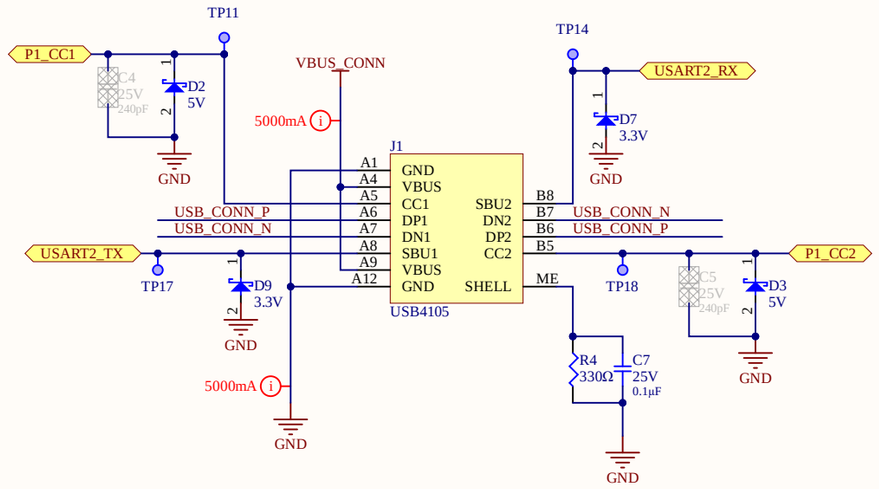

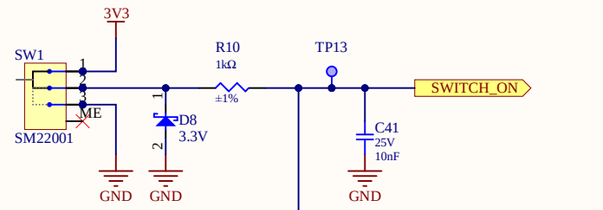

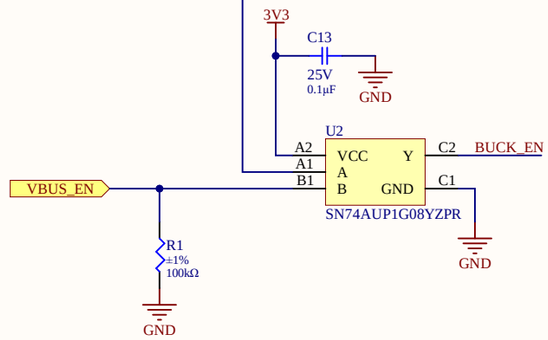

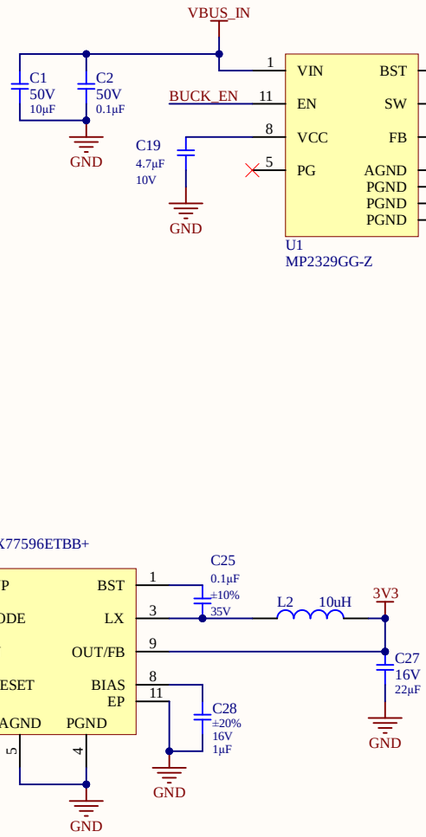

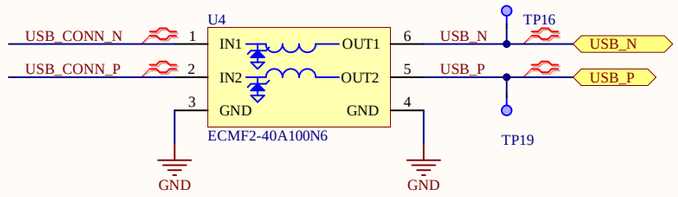

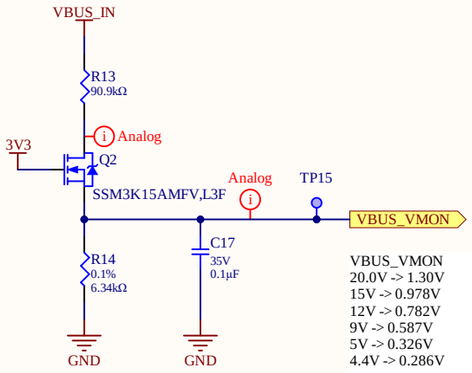

Title	***Power***		
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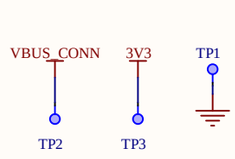
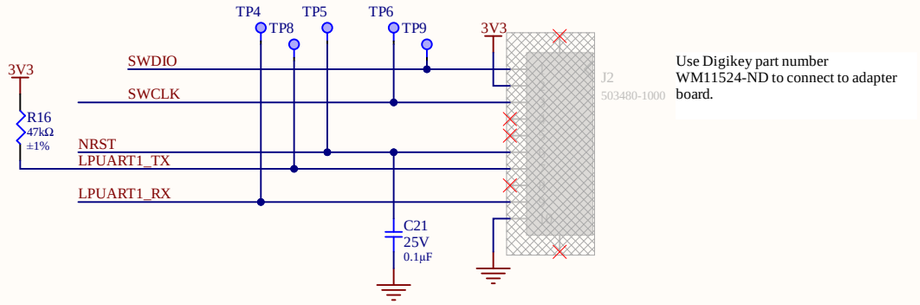
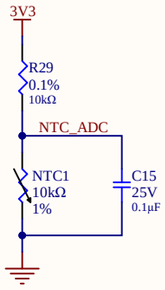
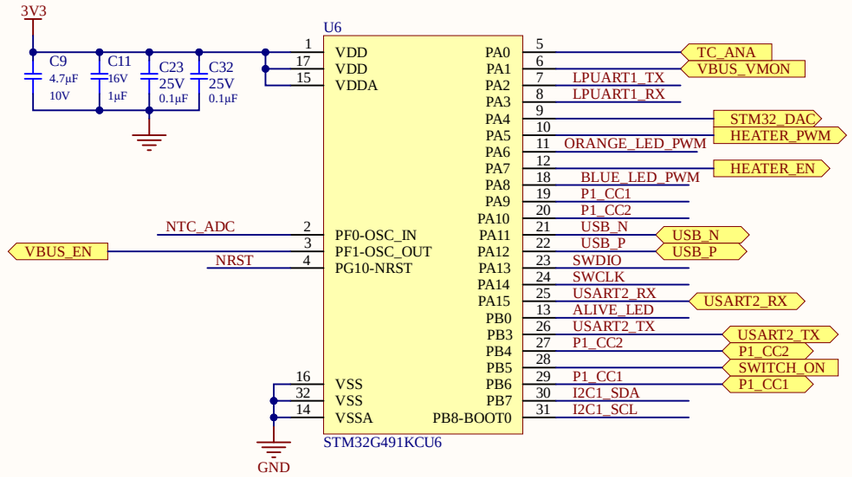
Programming and Debug test points

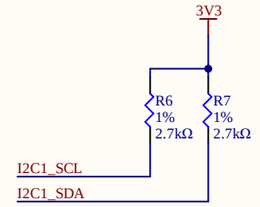


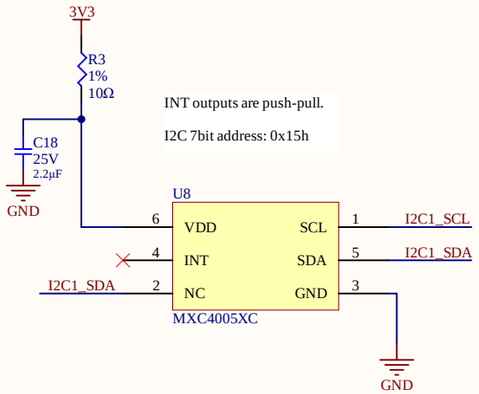


Use Digikey part number WM11524-ND to connect to adapter board.



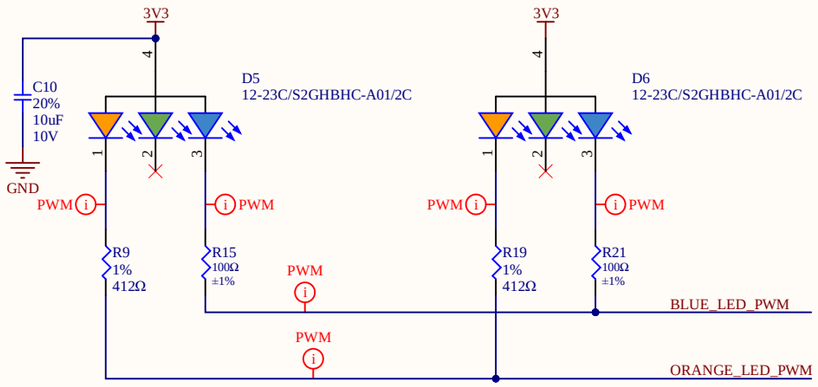




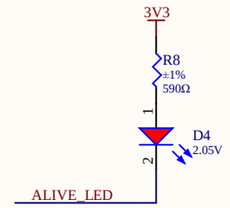


INT outputs are push-pull.

I2C 7bit address: 0x15h



Due to placement, C10 decouples both LEDs



INTERRUPTS

PB5: SWITCH_ON

PERIPHERALS

PB3: USART2_TX
PA15: USART2_RX

PA2: LPUART1_TX
PA3: LPUART1_RX

PB8: I2C1_SCL
PB7: I2C1_SDA

PB4: USBPD1 CC2
PB6: USBPD1 CC1

PA9: USBPD1 DBCC1
PA10: USBPD1 DBCC2

ADC

PA0: ADC1_IN1
PA1: ADC1_IN2
PB0: ADC1_IN15
PF0: ADC1_IN10

DAC

PA4: DAC1_OUT1

PWM

PA5: TIM2_CH1
PA6: TIM3_CH1
PA8: TIM1_CH1

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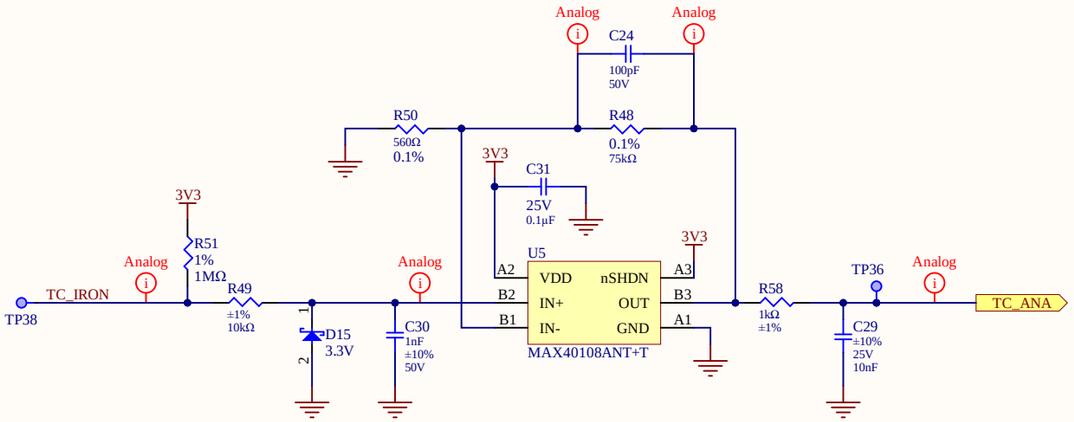
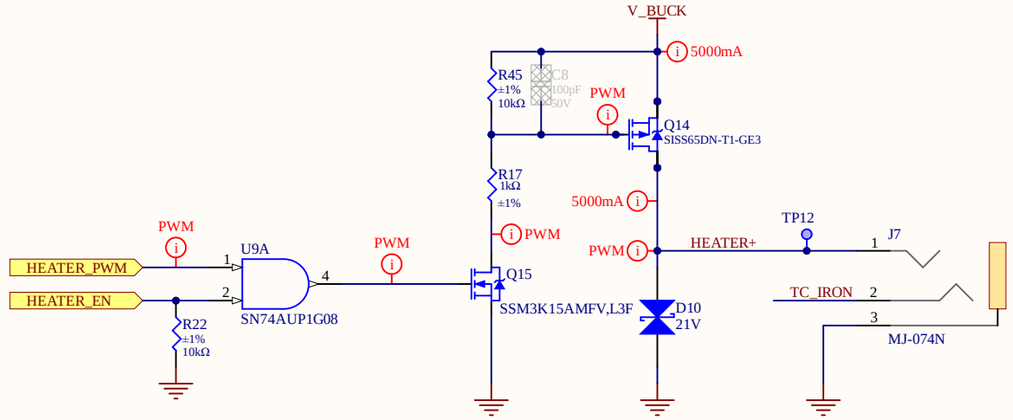
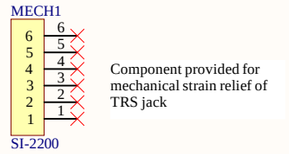
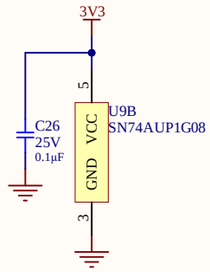


Thermocouple front end designed for K-Type or J-type only.





Component provided for mechanical strain relief of TRS jack



Title	***Heater***		
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