NIO 12L

Size: C	Title: NIO 12	REV: X1.2
	Page Name: Cover	
Date: Wednesday, November 01, 2023	Sheet 01 of 34	

NIO 12L Index

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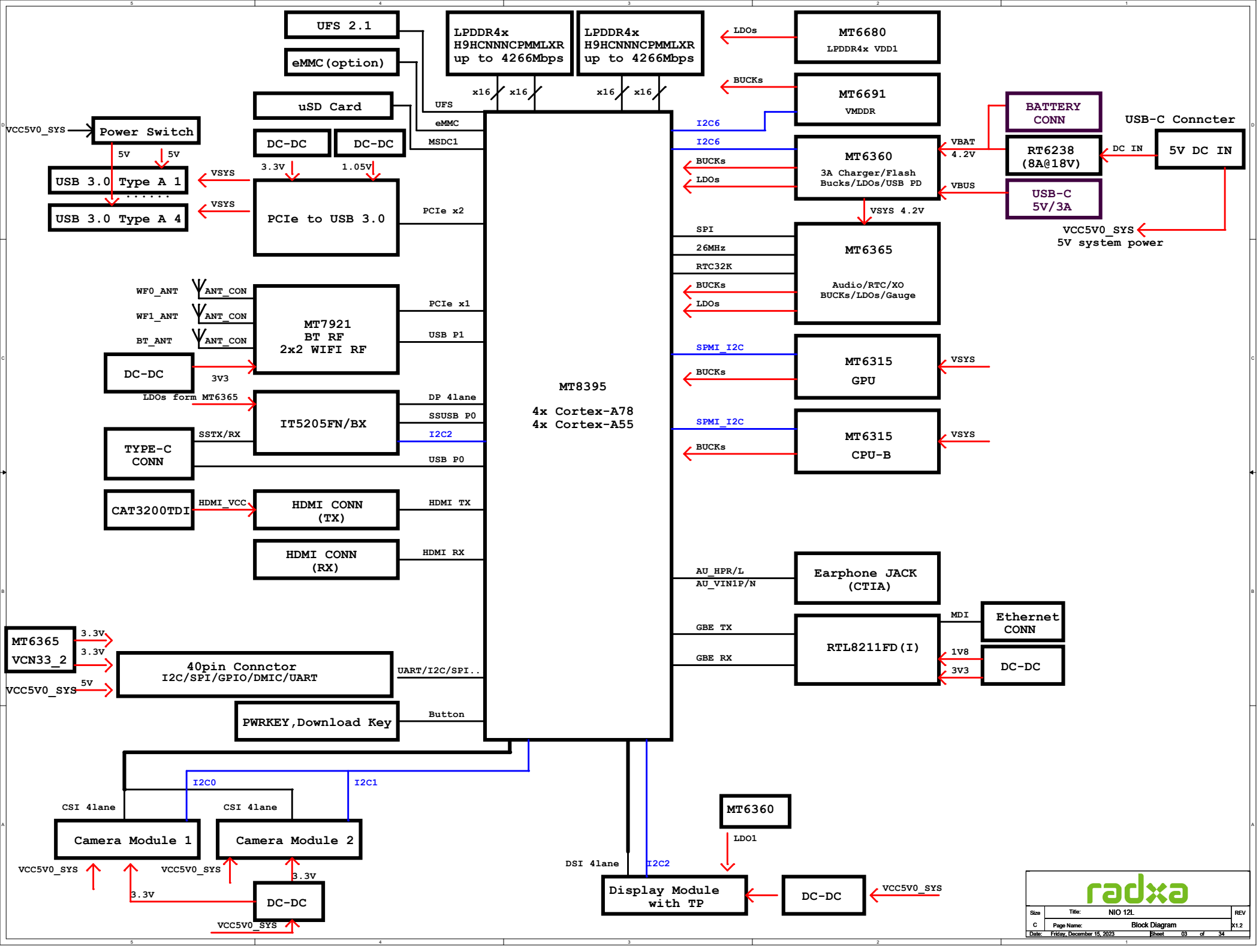
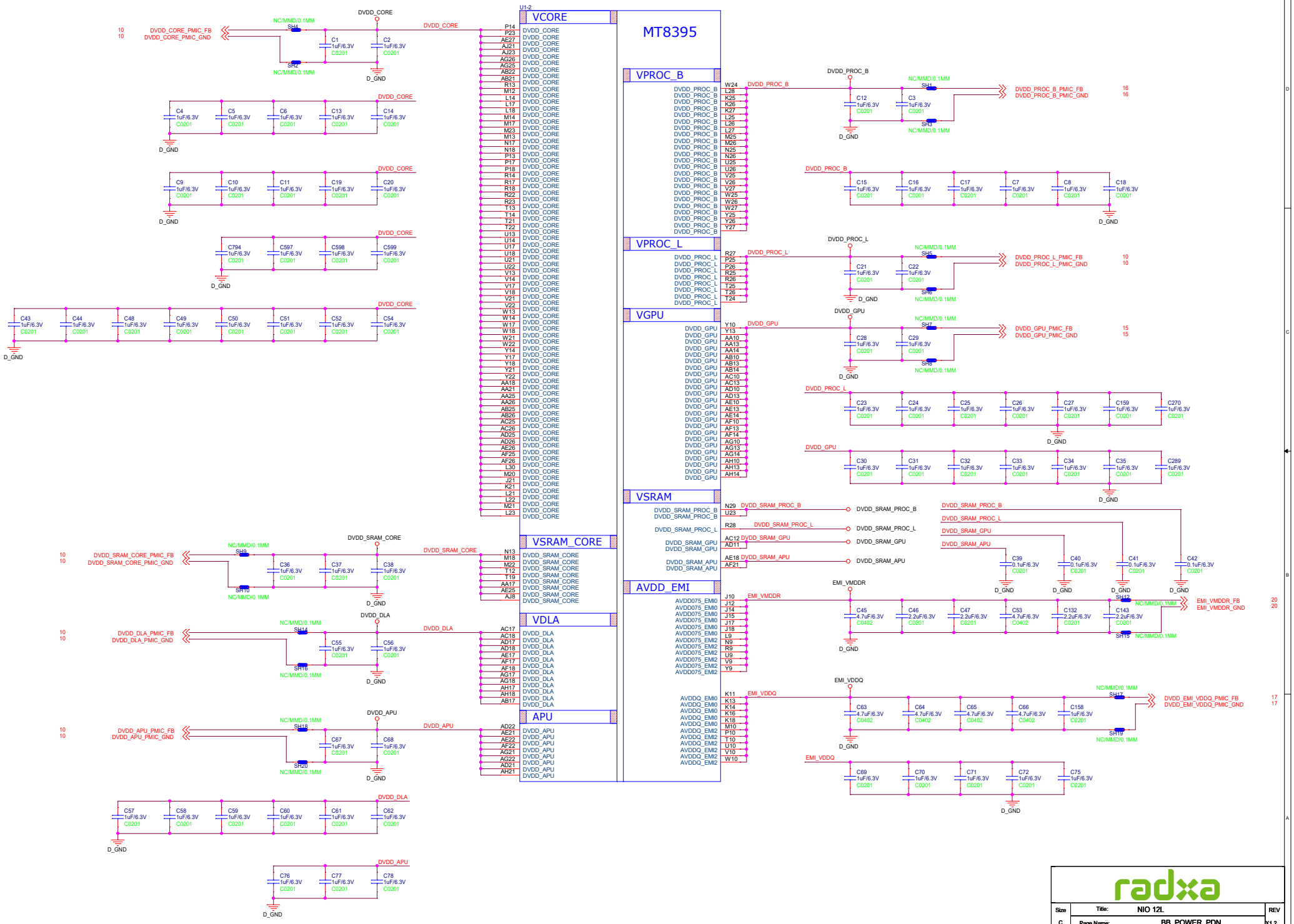
Size	Title:	REV
C	NIO 12L	X1.2
	Page Name: Index	
Date: Wednesday, November 01, 2023	Sheet 02 of 34	


UFS 2.1
eMMC(option)
LPDDR4x
H9HCNNNCPMMLXR
up to 4266Mbps
LPDDR4x
H9HCNNNCPMMLXR
up to 4266Mbps
x16
x16
x16
x16
LDOs
MT6680
LPDDR4x VDD1
BUCKs
MT6691
VMDDR
uSD Card
UFS
eMMC
MSDC1
I2C6
I2C6
BUCKs
LDOs
VCC5V0_SYS
Power Switch
5V
5V
DC-DC
DC-DC
3.3V
1.05V
USB 3.0 Type A 1
USB 3.0 Type A 4
VSYS
VSYS
PCIe to USB 3.0
PCIe x2
MT6360
3A Charger/Flash
Bucks/LDOs/USB PD
VBAT
4.2V
VBUS
VSYS 4.2V
BATTERY
CONN
RT6238
(8A@18V)
DC IN
USB-C Conncter
5V DC IN
USB-C
5V/3A
VCC5V0_SYS
5V system power
SPI
26MHz
RTC32K
BUCKs
LDOs
MT6365
Audio/RTC/XO
BUCKs/LDOs/Gauge
WF0_ANT
WF1_ANT
BT_ANT
ANT_CON
ANT_CON
ANT_CON
MT7921
BT RF
2x2 WIFI RF
PCIe x1
USB P1
DC-DC
3V3
SPMI_I2C
BUCKs
MT6315
GPU
VSYS
LDOs form MT6365
IT5205FN/BX
DP 4lane
SSUSB P0
I2C2
MT8395
4x Cortex-A78
4x Cortex-A55
SPMI_I2C
BUCKs
MT6315
CPU-B
VSYS
TYPE-C
CONN
SSTX/RX
USB P0
CAT3200TDI
HDMI_VCC
HDMI CONN
(TX)
HDMI TX
HDMI CONN
(RX)
HDMI RX
AU_HPR/L
AU_VIN1P/N
Earphone JACK
(CTIA)
MT6365
VCN33_2
3.3V
3.3V
5V
VCC5V0_SYS
40pin Connctor
I2C/SPI/GPIO/DMIC/UART
UART/I2C/SPI..
GBE TX
GBE RX
RTL8211FD(I)
MDI
Ethernet
CONN
1V8
3V3
DC-DC
PWRKEY,Download Key
Button
I2C0
I2C1
CSI 4lane
CSI 4lane
Camera Module 1
Camera Module 2
VCC5V0_SYS
VCC5V0_SYS
3.3V
3.3V
DC-DC
VCC5V0_SYS
MT6360
LDO1
DSI 4lane
I2C2
Display Module
with TP
DC-DC
VCC5V0_SYS
radxa
Size
C
Title: NIO 12L
REV
X1.2
Page Name: Block Diagram
Date: Friday, December 15, 2023
Sheet 03 of 34



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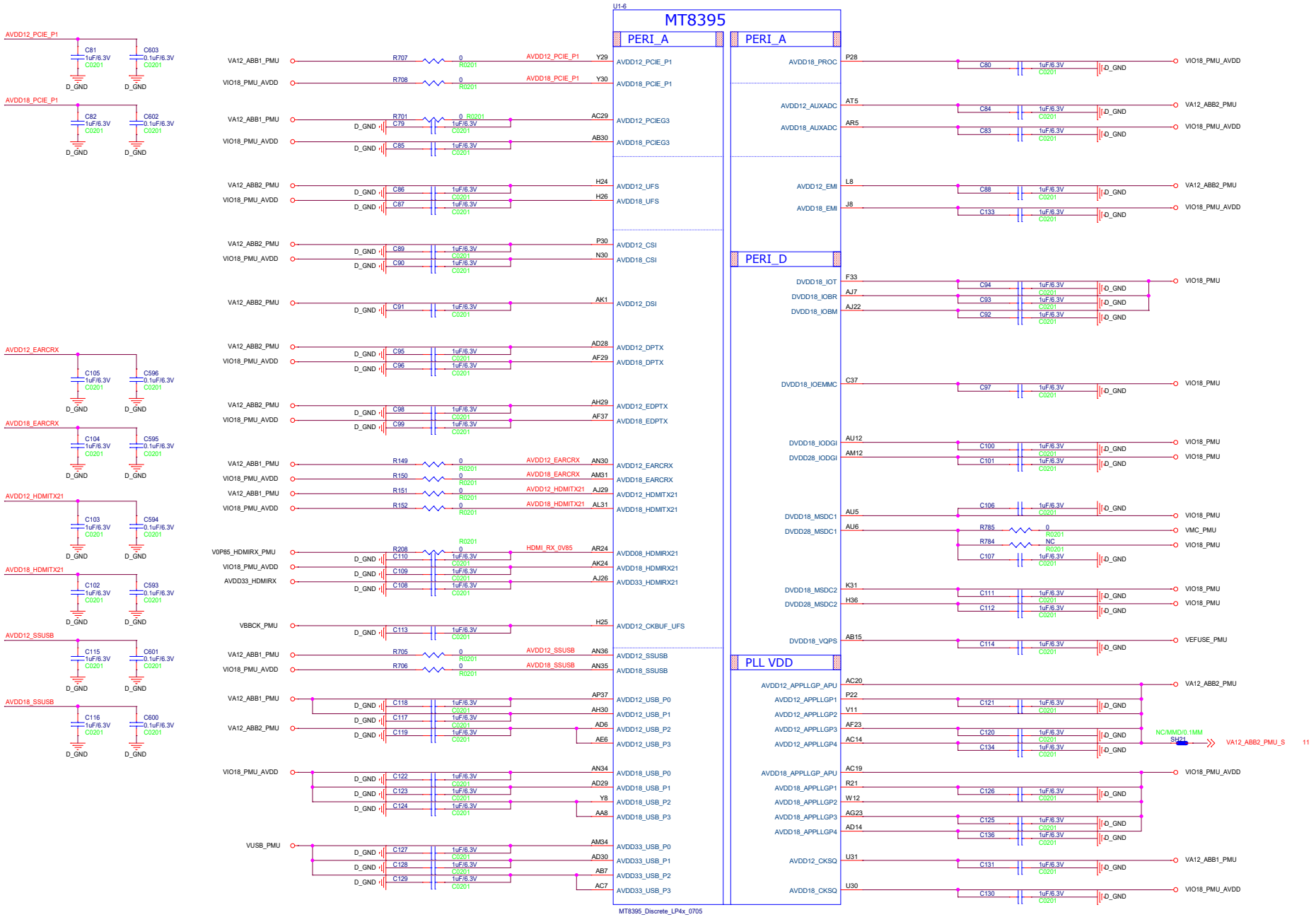
C	Page Name: BB_POWER_PDN		X1.2
Date: Wednesday, November 01, 2023	Sheet 04 of 34		



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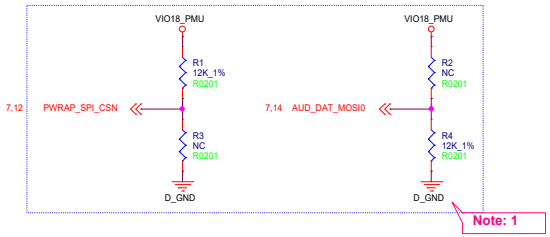
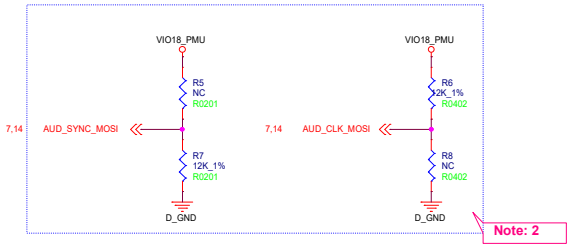
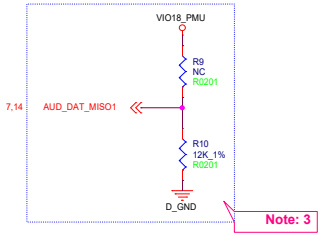
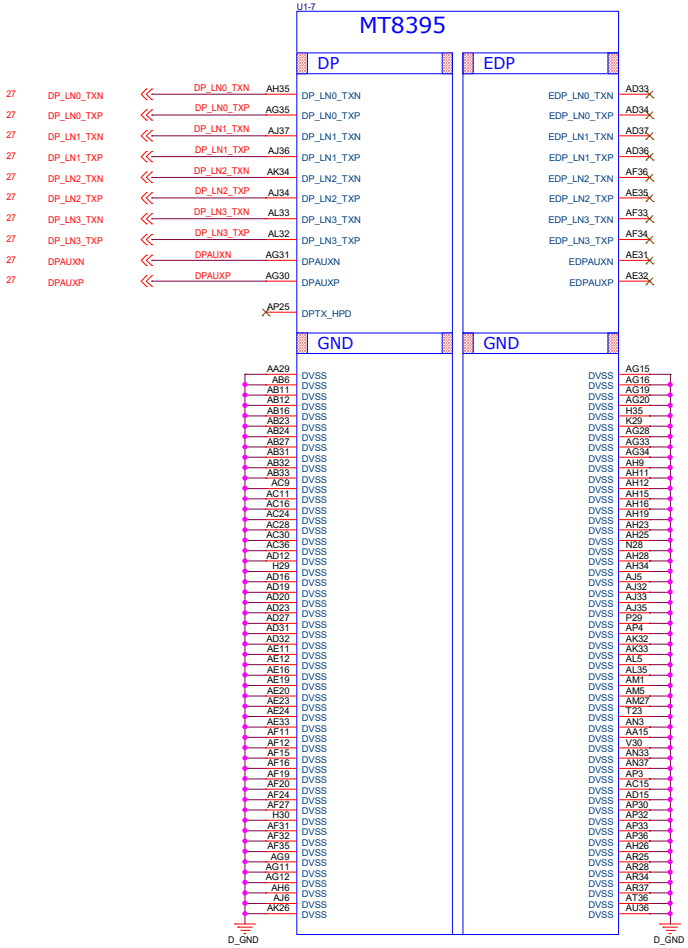
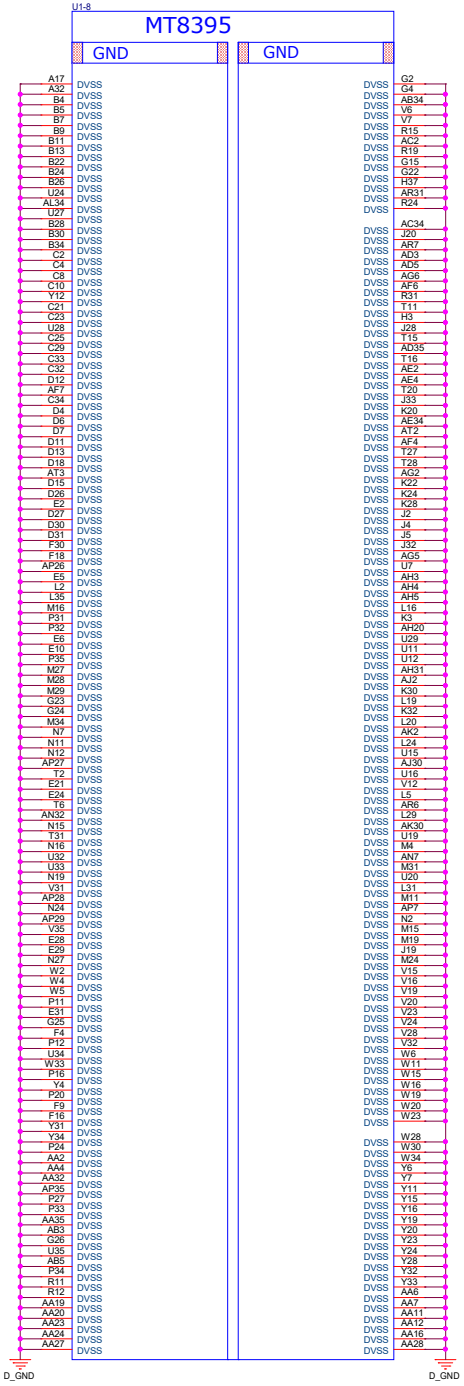
	Page Name: BB_POWER_IO	
Date: Friday, December 15, 2023	Sheet 05 of 34	











Schematic design notice:

Note 1: "PWRAP_SPI_CSN" and "AUD_DAT_MOS0"I pin features in trapping pin to enable JTAG.

PWRAP_SPI0_CSN	AUD_DAT_MOSI0	AP JTAG	ADSP or SCP JTAG
H (Default)	L (Default)	N/A	N/A
H	H (by external PU)	DMIC2_SCK, PCM_DO PCM_CLK, PCM_DI PCM_SYNC	N/A
L(by external PD)	L	MSDC1_CLK, MSDC1_CMD, MSDC1_DAT0, MSDC1_DAT1, MSDC1_DAT2	ADSP JTAG: PCIE_WAKE_N, PCIE_PERESET_N, PCIE_CLKREQ_N CMMRST, CMMPDN
L(by external PD)	H (by external PU)	MSDC1_CLK, MSDC1_CMD, MSDC1_DAT0, MSDC1_DAT1, MSDC1_DAT2	SCP JTAG: SPIM1_CSB, SPIM1_CLK SPIM1_MO, SPIM1_MI USB_DRV_VBUS_1P

Note 2: "AUD_SYNC_MOSI" and "AUD_CLK_MOSI" pin features in trapping pin to booting (eMMC/UFS/SPI NOR).

AUD_SYNC_MOSI	AUD_CLK_MOSI	Storage Booting
L (Default)	L (Default)	Only eMMC boot
L	H (by external PU)	Only UFS boot
H (by external PD)	L	Only SPI NAND boot
H (by external PD)	H (by external PU)	Only SPI NOR boot

Note 3: "AUD_DAT_MISO1" is trapping pin to select VEMC Voltage.

AUD_DAT_MISO1	VEMC Voltage
L (Default)	VEMC=3.0V
H (by external PU)	VEMC=2.5V

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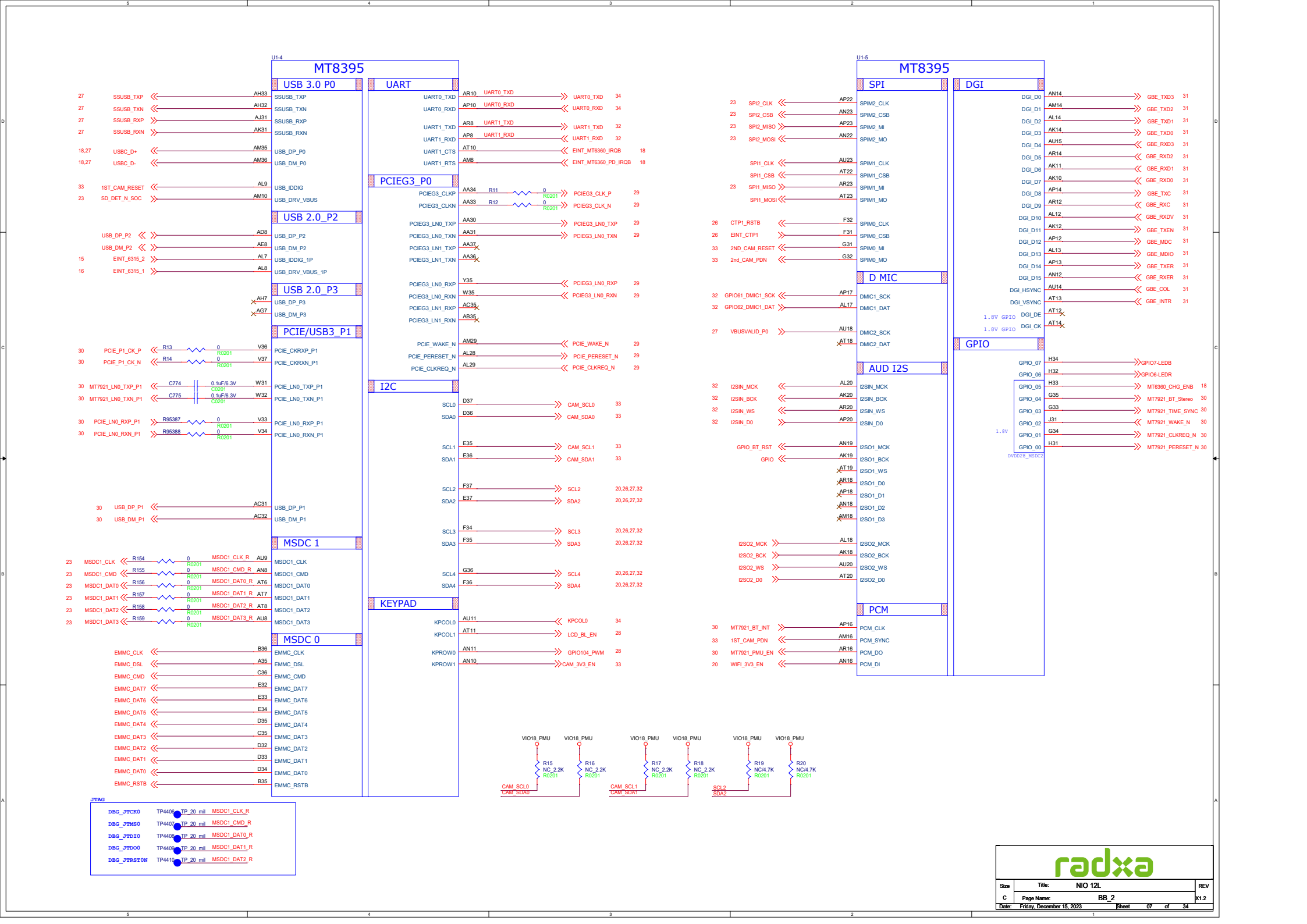
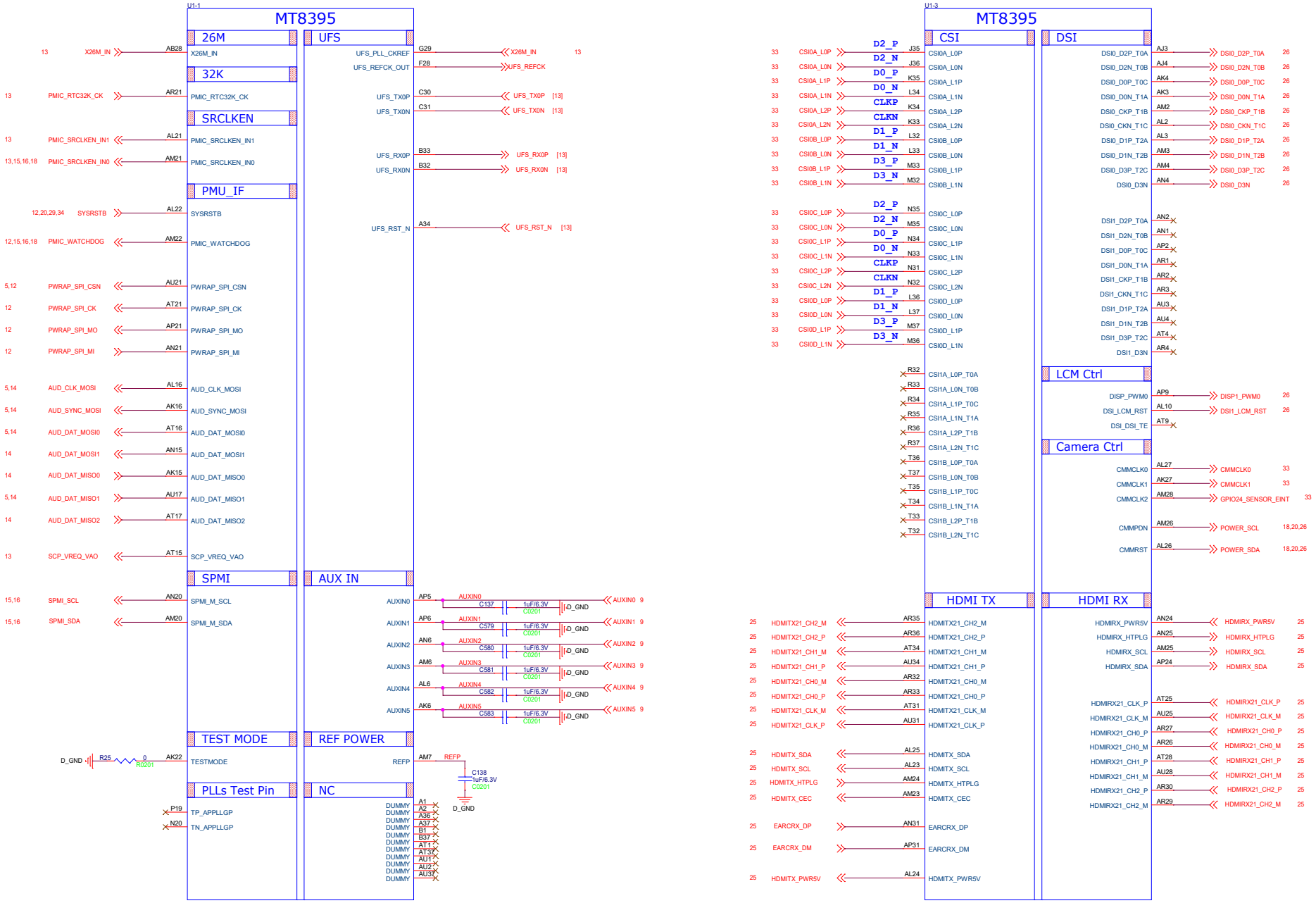
Size	Title:	REV
C	NIO 12L	X1.2
	Page Name: BB_1	
Date: Wednesday, November 01, 2023	Sheet 06 of 34	


U1-4
MT8395
USB 3.0 P0
SSUSB_TXP
SSUSB_TXN
SSUSB_RXP
SSUSB_RXN
USB_DP_P0
USB_DM_P0
USB_IDDIG
USB_DRV_VBUS
USB 2.0_P2
USB_DP_P2
USB_DM_P2
USB_IDDIG_1P
USB_DRV_VBUS_1P
USB 2.0_P3
USB_DP_P3
USB_DM_P3
PCIE/USB3_P1
PCIE_CKRXP_P1
PCIE_CKRXN_P1
PCIE_LN0_TXP_P1
PCIE_LN0_TXN_P1
PCIE_LN0_RXP_P1
PCIE_LN0_RXN_P1
USB_DP_P1
USB_DM_P1
MSDC 1
MSDC1_CLK
MSDC1_CMD
MSDC1_DAT0
MSDC1_DAT1
MSDC1_DAT2
MSDC1_DAT3
MSDC 0
EMMC_CLK
EMMC_DSL
EMMC_CMD
EMMC_DAT7
EMMC_DAT6
EMMC_DAT5
EMMC_DAT4
EMMC_DAT3
EMMC_DAT2
EMMC_DAT1
EMMC_DAT0
EMMC_RSTB
UART
UART0_TXD
UART0_RXD
UART1_TXD
UART1_RXD
UART1_CTS
UART1_RTS
PCIEG3_P0
PCIEG3_CLKP
PCIEG3_CLKN
PCIEG3_LN0_TXP
PCIEG3_LN0_TXN
PCIEG3_LN1_TXP
PCIEG3_LN1_TXN
PCIEG3_LN0_RXP
PCIEG3_LN0_RXN
PCIEG3_LN1_RXP
PCIEG3_LN1_RXN
PCIE_WAKE_N
PCIE_PERESET_N
PCIE_CLKREQ_N
I2C
SCL0
SDA0
SCL1
SDA1
SCL2
SDA2
SCL3
SDA3
SCL4
SDA4
KEYPAD
KPCOL0
KPCOL1
KPROW0
KPROW1
JTAG
DBG_JTCK0
DBG_JTMS0
DBG_JTDI0
DBG_JTDO0
DBG_JTRSTON
U1-5
MT8395
SPI
SPIM2_CLK
SPIM2_CSB
SPIM2_MI
SPIM2_MO
SPIM1_CLK
SPIM1_CSB
SPIM1_MI
SPIM1_MO
SPIM0_CLK
SPIM0_CSB
SPIM0_MI
SPIM0_MO
D MIC
DMIC1_SCK
DMIC1_DAT
DMIC2_SCK
DMIC2_DAT
AUD I2S
I2SIN_MCK
I2SIN_BCK
I2SIN_WS
I2SIN_D0
I2SO1_MCK
I2SO1_BCK
I2SO1_WS
I2SO1_D0
I2SO1_D1
I2SO1_D2
I2SO1_D3
I2SO2_MCK
I2SO2_BCK
I2SO2_WS
I2SO2_D0
PCM
PCM_CLK
PCM_SYNC
PCM_DO
PCM_DI
DGI
DGI_D0
DGI_D1
DGI_D2
DGI_D3
DGI_D4
DGI_D5
DGI_D6
DGI_D7
DGI_D8
DGI_D9
DGI_D10
DGI_D11
DGI_D12
DGI_D13
DGI_D14
DGI_D15
DGI_HSYNC
DGI_VSYNC
DGI_DE
DGI_CK
GPIO
GPIO_07
GPIO_06
GPIO_05
GPIO_04
GPIO_03
GPIO_02
GPIO_01
GPIO_00
VIO18_PMU
R15 NC_2.2K R0201
R16 NC_2.2K R0201
R17 NC_2.2K R0201
R18 NC_2.2K R0201
R19 NC/4.7K R0201
R20 NC/4.7K R0201
radxa
Size C
Title: NIO 12L
REV X1.2
Page Name: BB_2
Date: Friday, December 15, 2023
Sheet 07 of 34

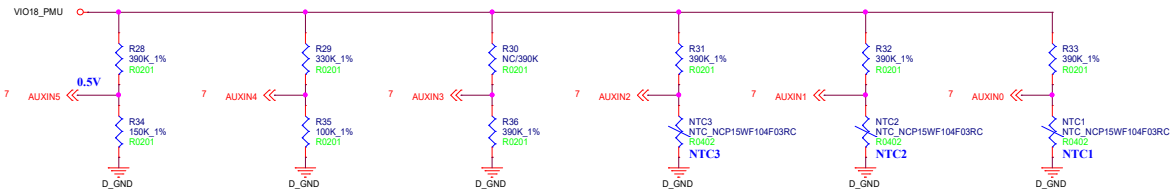


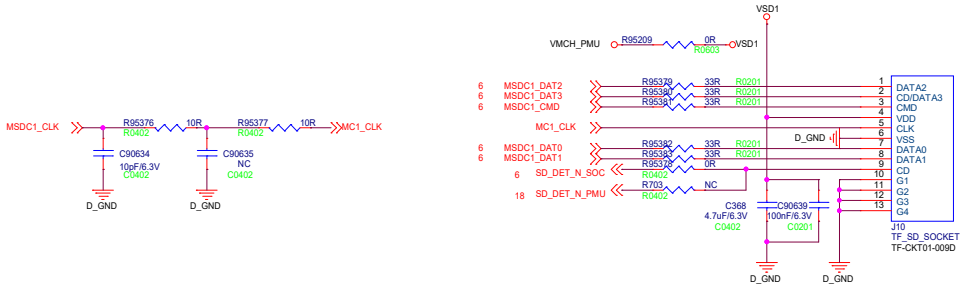
Size	Title: NIO 12L		REV
C	Page Name: BB_3		X1.2
Date: Friday, December 15, 2023	Sheet 08 of 34		

Schematic design notice of "BB_4_Interface" page:

Note 1: R26, R27 please select 60.4 ohm (1%) resistor

Size C	Title: NIO 12L		REV X1.2
	Page Name: BB_4		
Date: Wednesday, November 01, 2023	Sheet 09 of 34		





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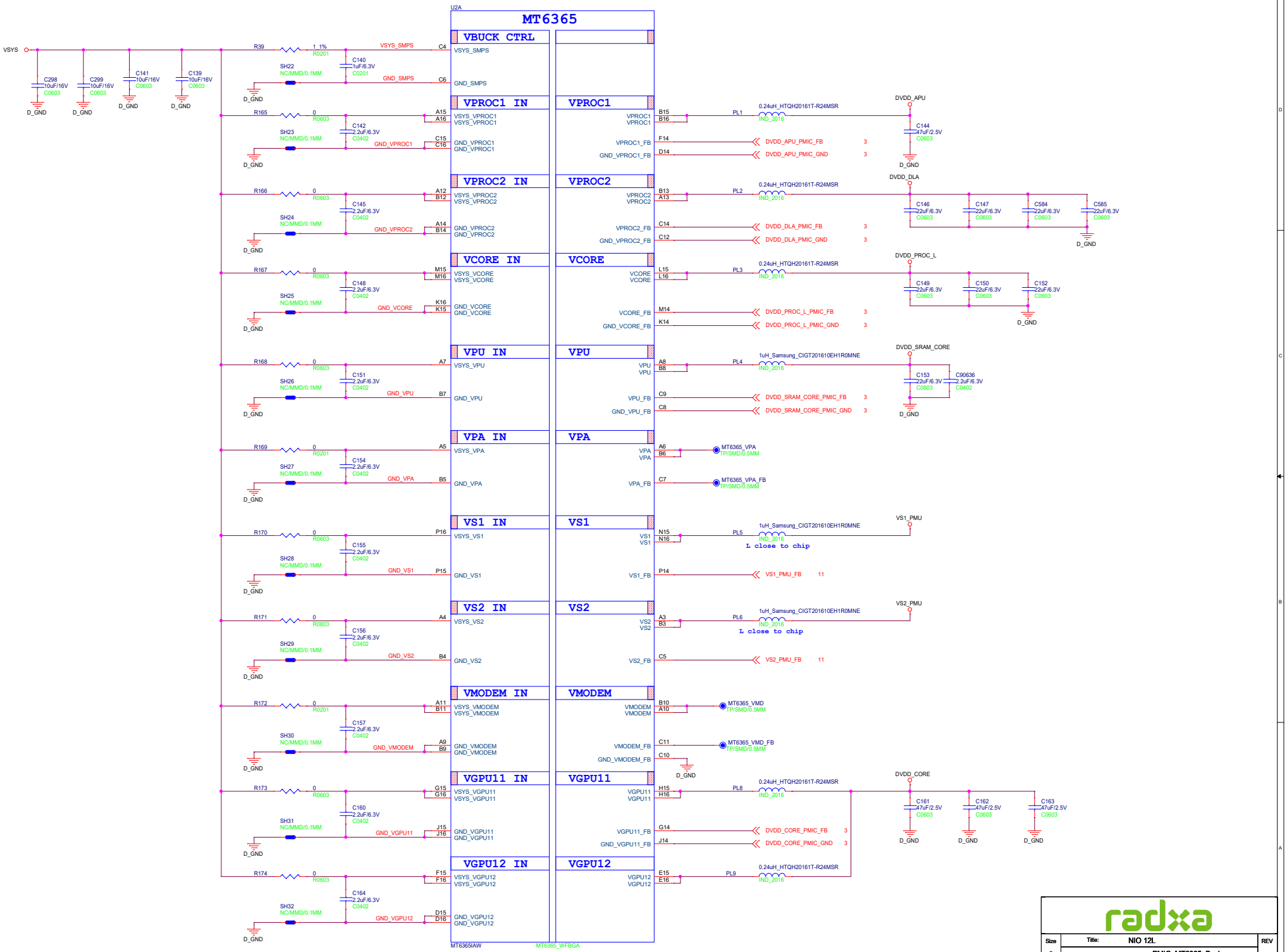
	Page Name: AUXADC_SD Card	
Date: Friday, December 15, 2023	Sheet 10 of 34	



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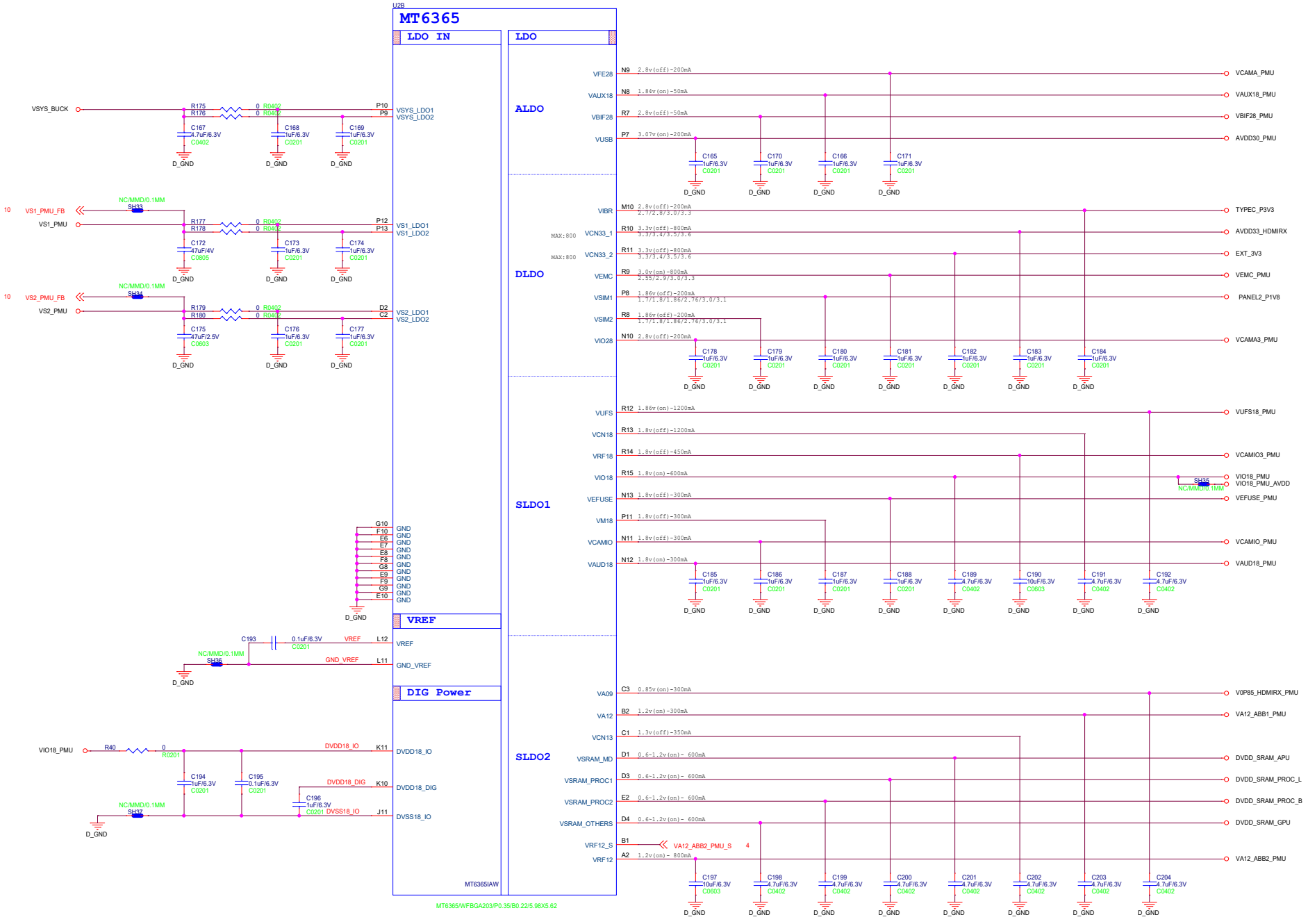
	Page Name: PMIC_MT6365_Buck	
Date: Friday, December 15, 2023	Sheet 11 of 34	



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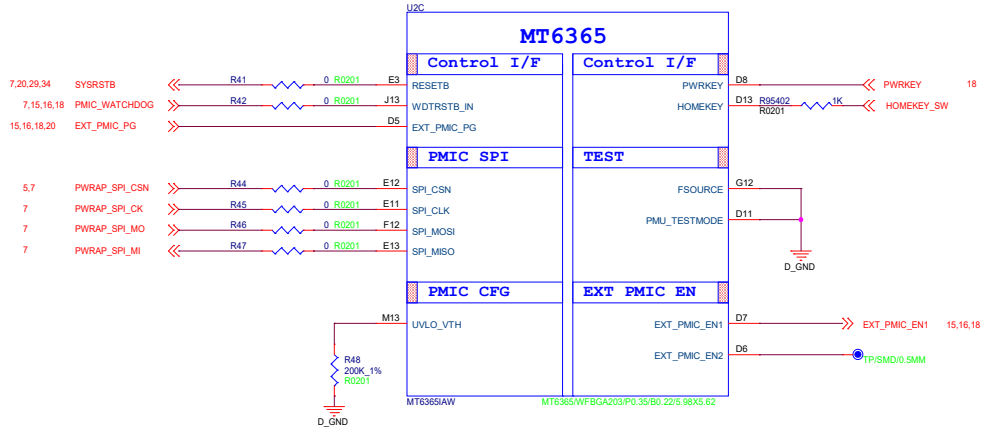
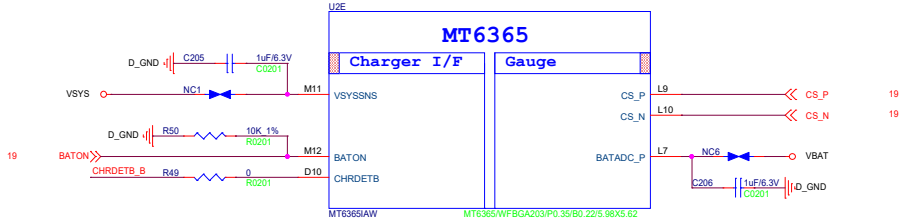
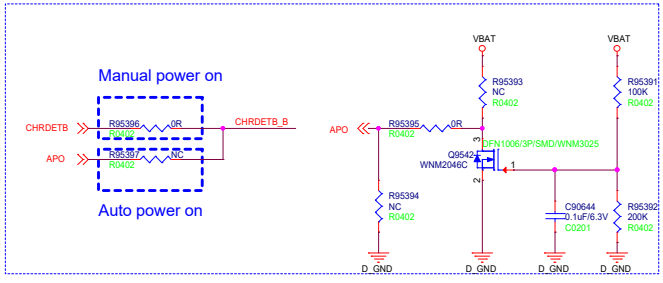
	Page Name: PMIC_MT6365_LDO	
Date: Friday, December 15, 2023	Sheet 12 of 34	





Option(NC)



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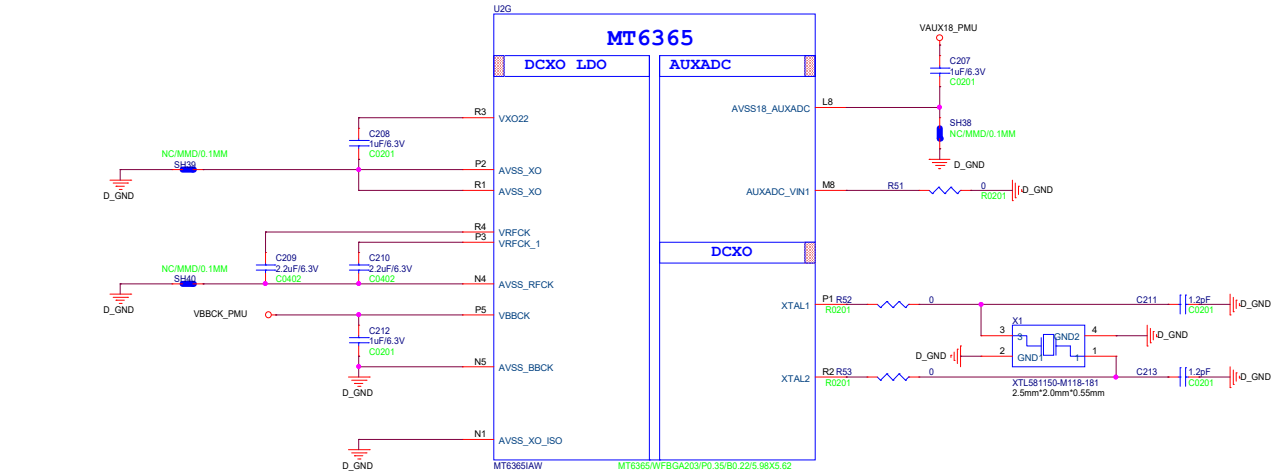
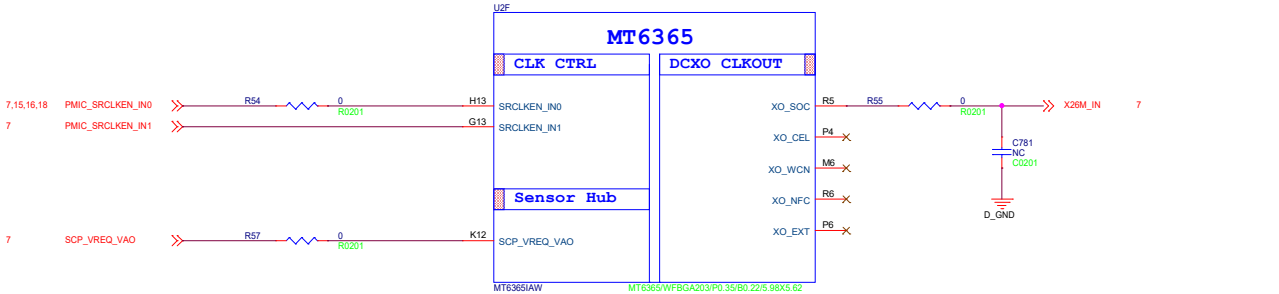
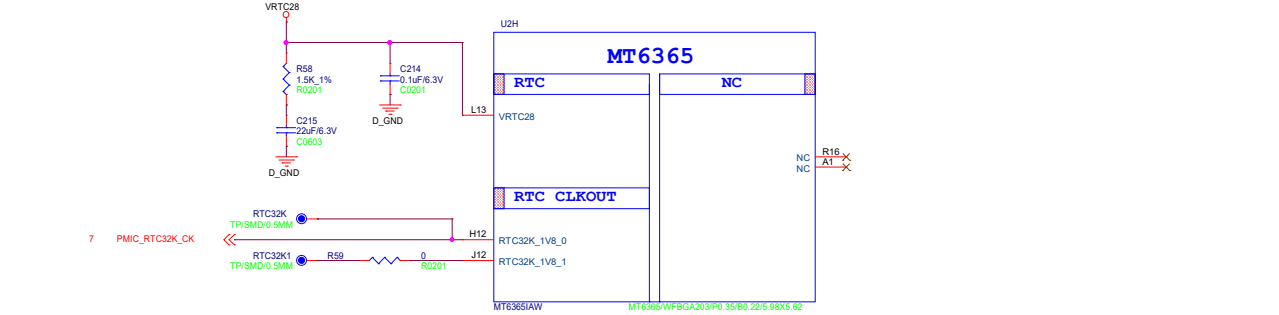
C	Page Name: PMIC_MT6365_General		X1.2
Date: Friday, December 15, 2023	Sheet 13 of 34		







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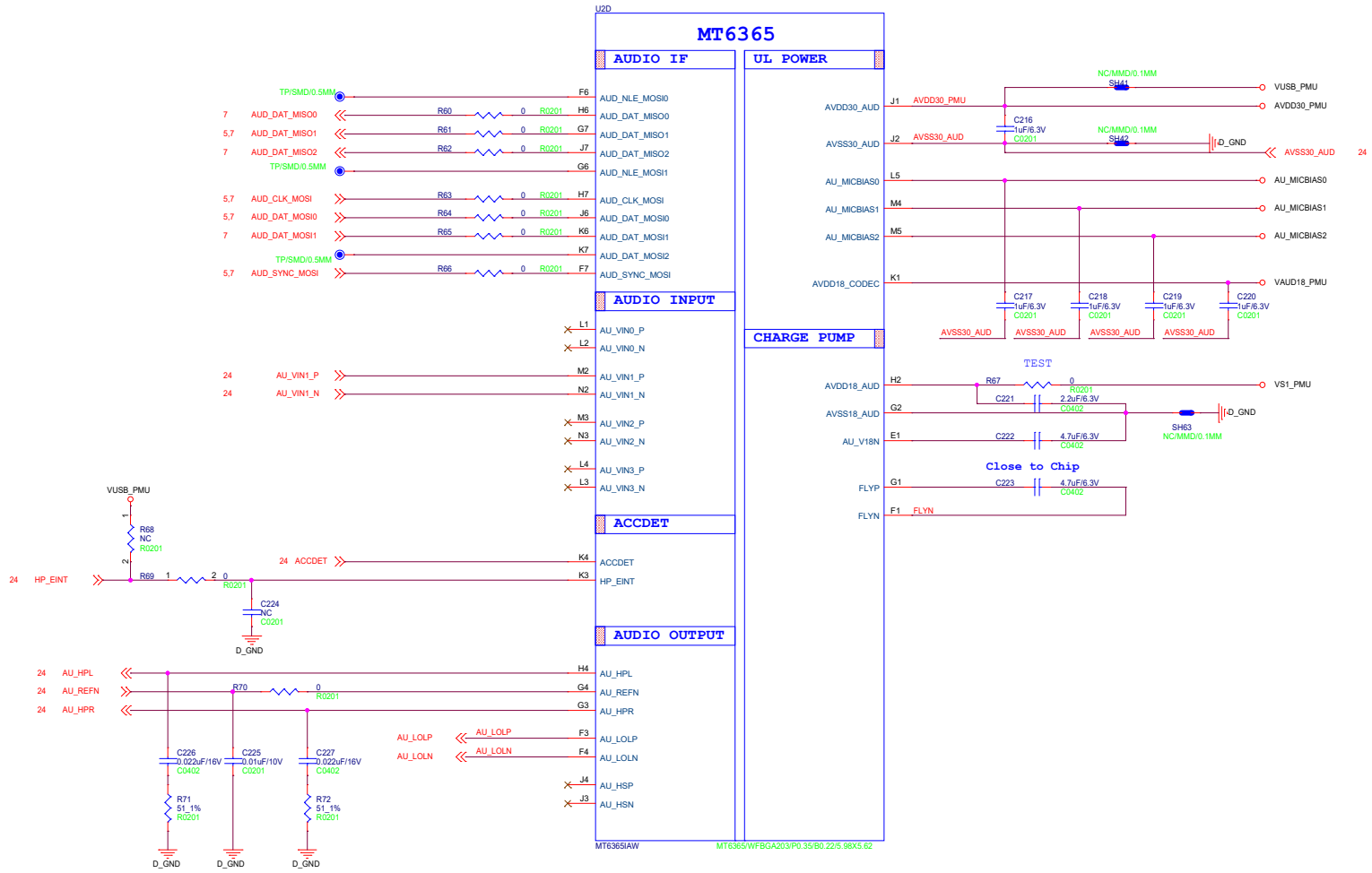
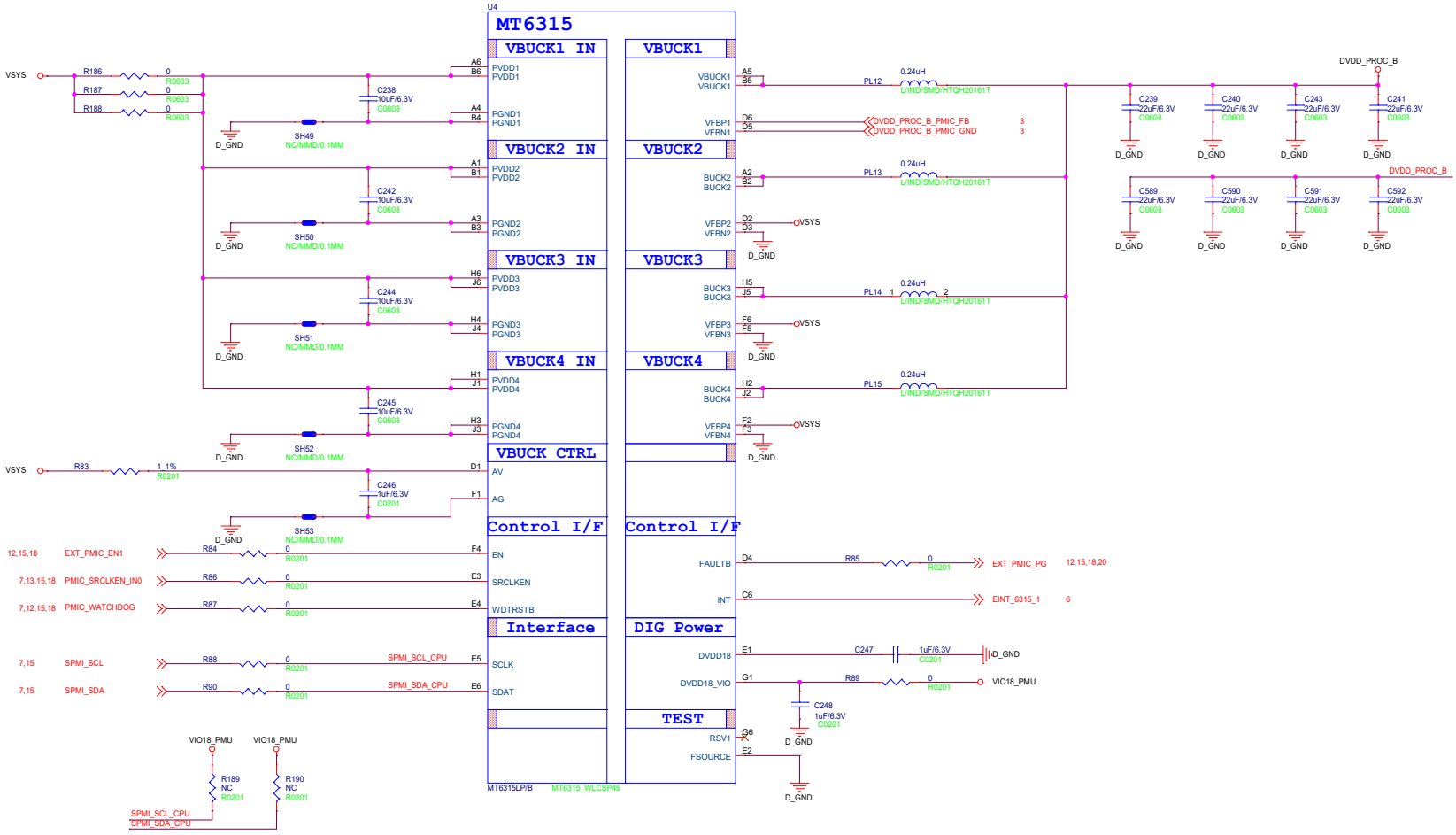
C	NIO 12L	
	Page Name: PMIC_MT6365_Clock	X1.2
Date: Friday, December 15, 2023	Sheet 14 of 34	



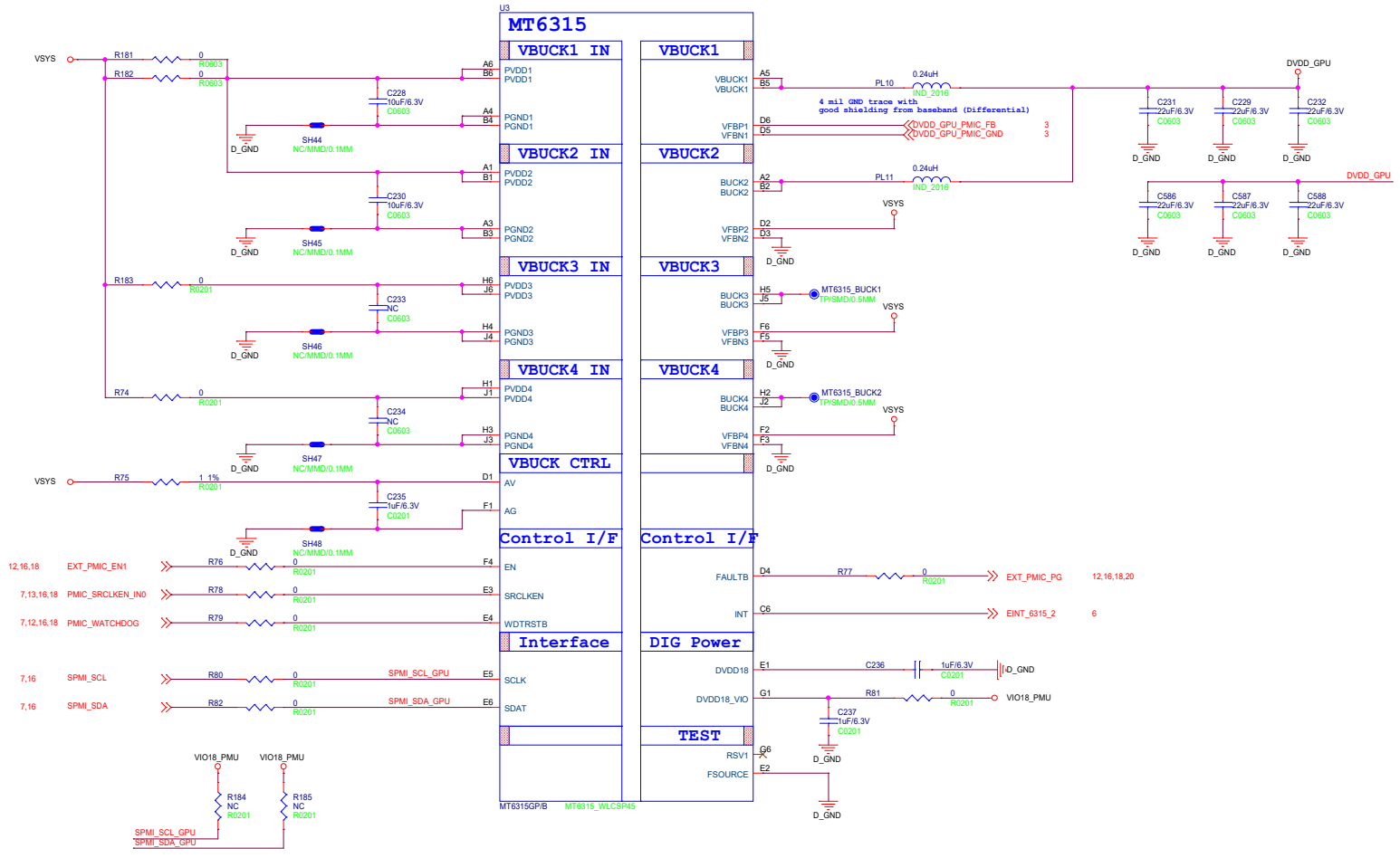
Size C	Title: NIO 12L	REV X1.2
	Page Name: PMIC_MT6365_AUDIO	
Date: Friday, December 15, 2023	Sheet 15 of 34	

MT6315 4-Phase Buck



Size	Title: NIO 12L		REV
C	Page Name:	PMIC_MT6315_1_CPU-B	X1.2
Date: Friday, December 15, 2023	Sheet 16 of 34		

MT6315 4-Phase Buck



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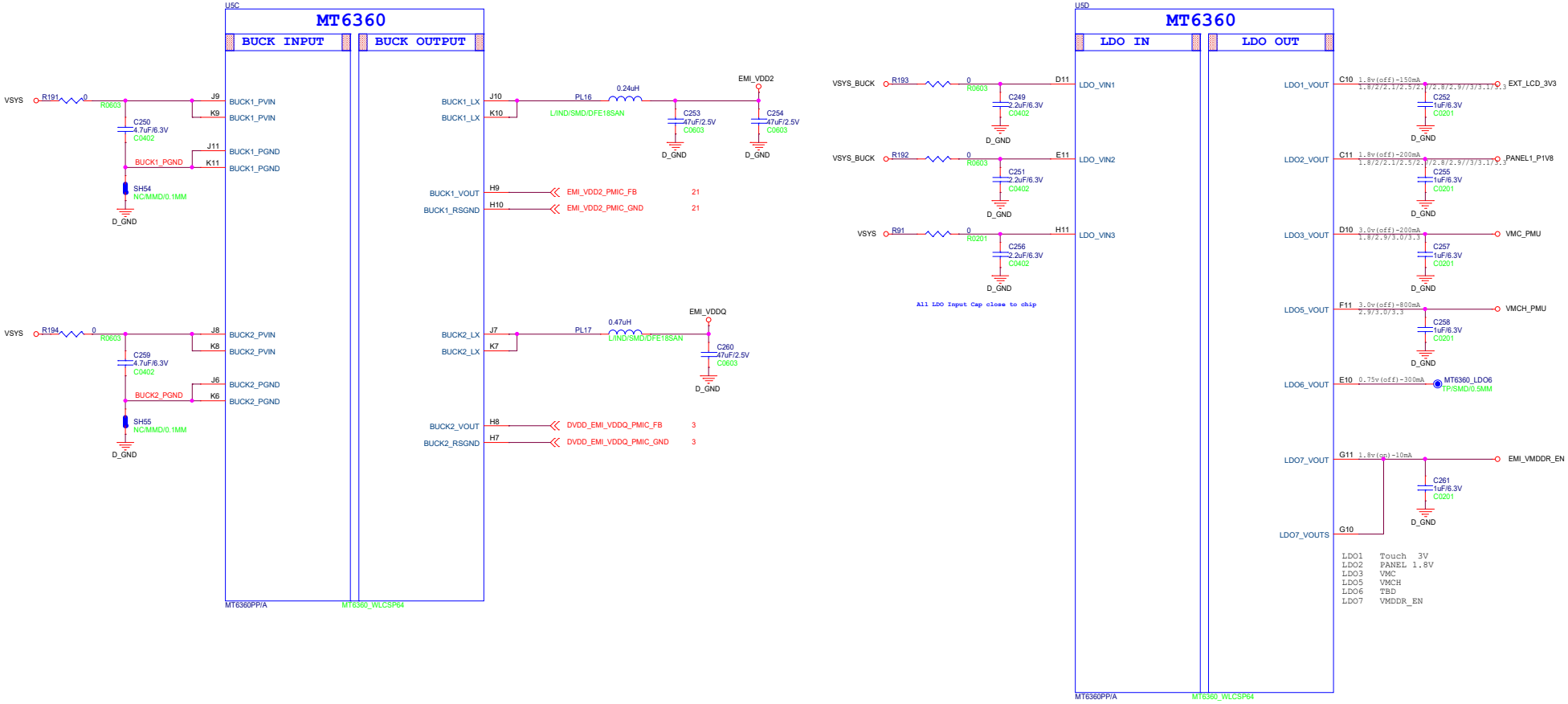
Date:	Friday, December 15, 2023	Sheet 16 of 34	



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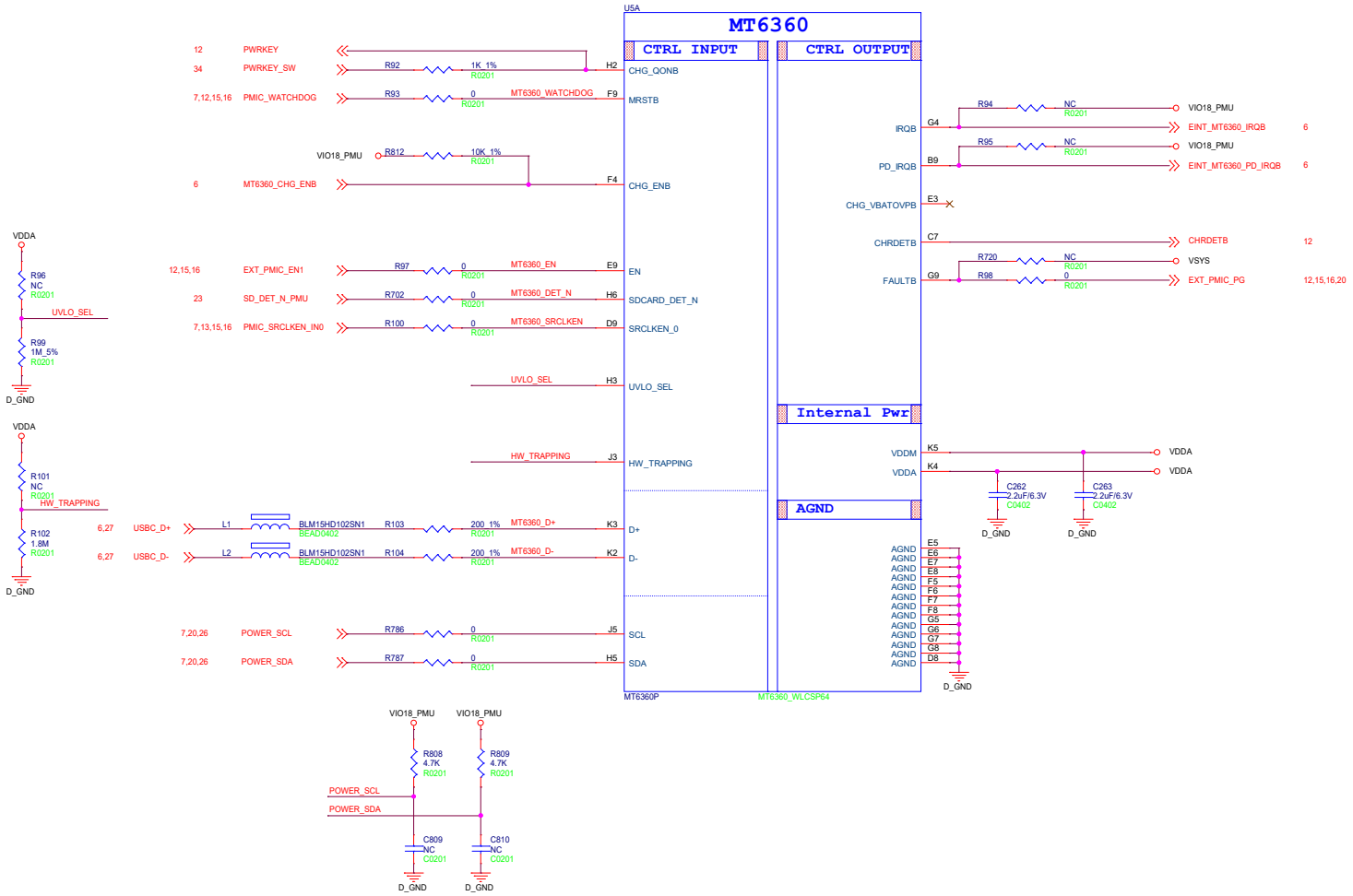
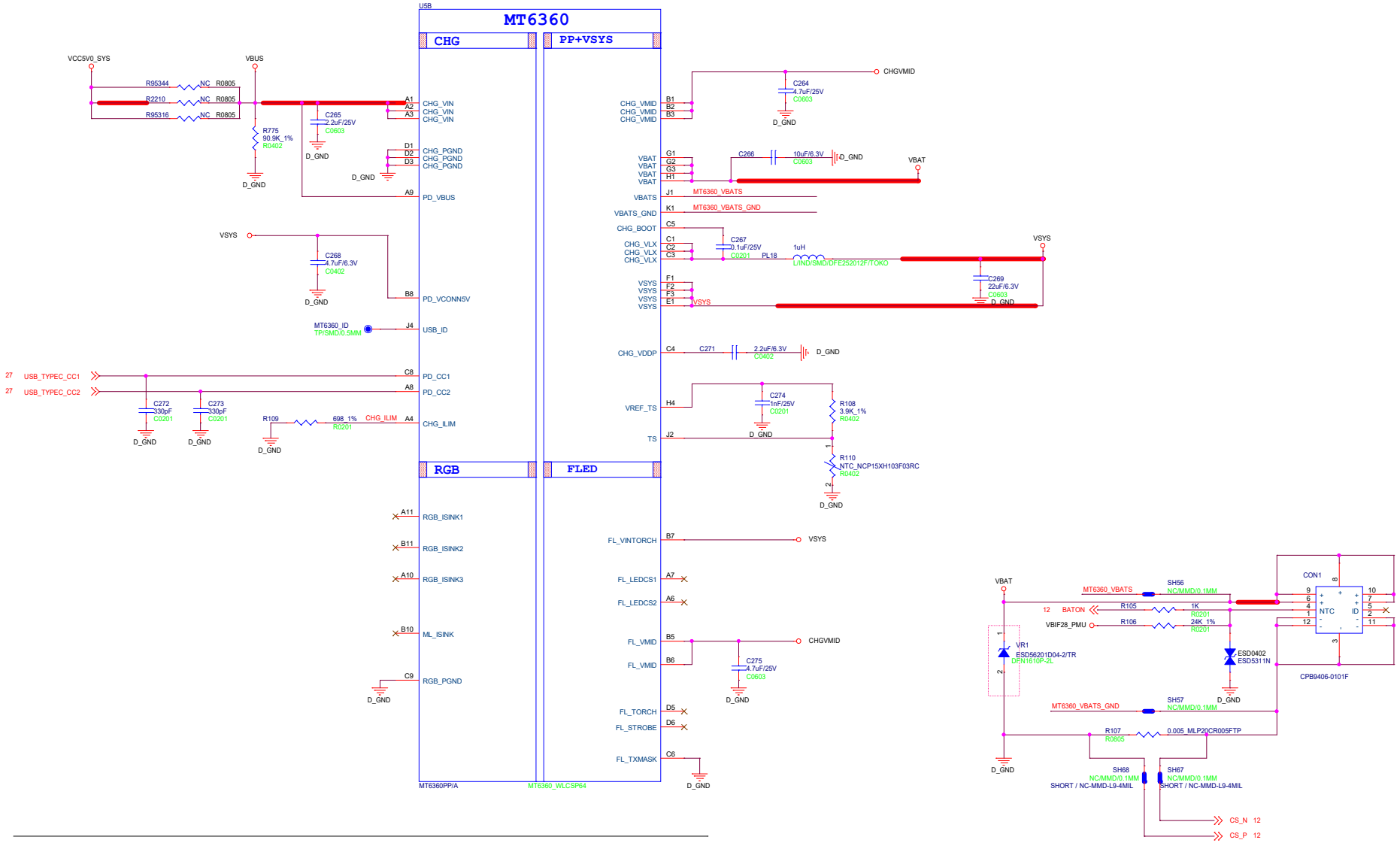
	Page Name: PMIC_MT6360_BUCK_LDO	
Date: Wednesday, November 01, 2023	Sheet 18 of 34	



Size C	Title: NIO 12L	REV X1.2
	Page Name: 19_PMIC_MT6360_General	
Date: Friday, December 15, 2023	Sheet 19 of 34	

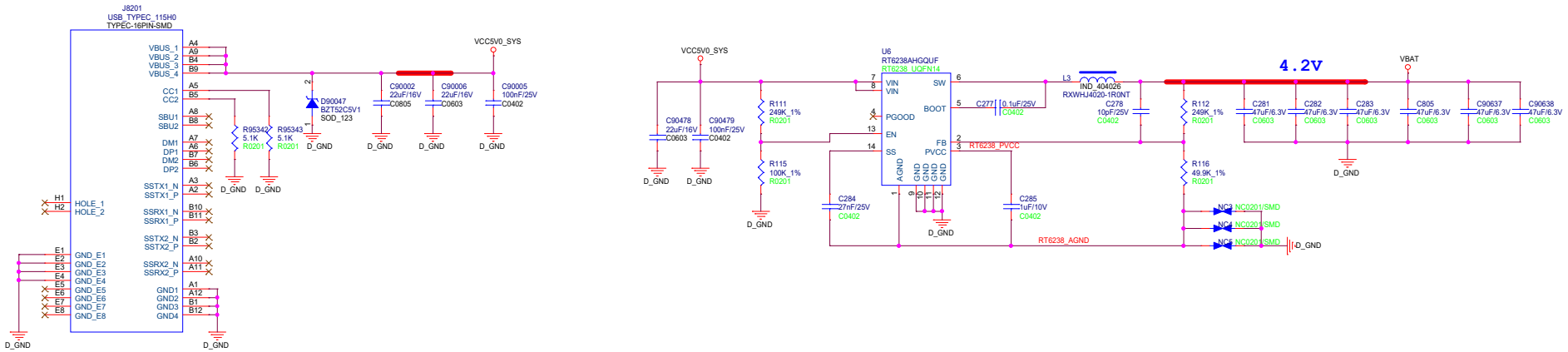


Schematic design notice of "28_POWER_MT6360_Charger" page.

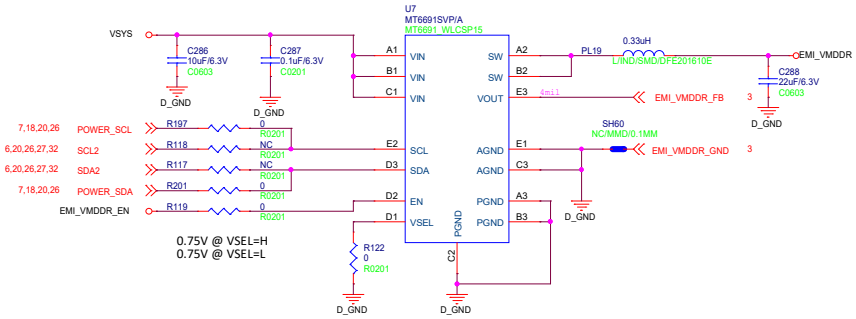
Note 28-1: For better ESD & surge performance we need choose suitable device for system protection. Please refer to the latest version of [Surge device selection guide] provided by MTK.

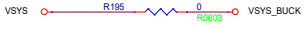
Size: C	Title: NIO 12L	REV: X1.2
	Page Name: PMIC_MT6360_Charger	
Date: Wednesday, November 01, 2023	Sheet 20 of 34	

5V DC IN/SYSTEM Power

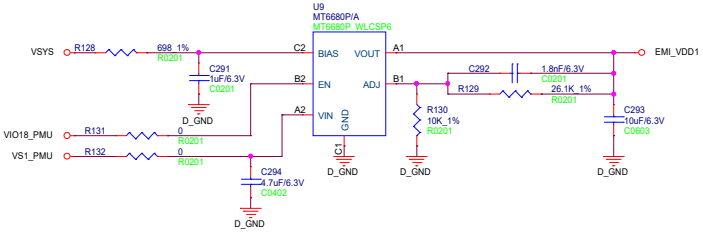


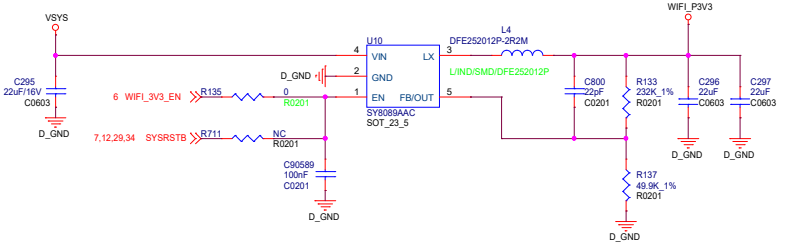
LP4X DRAM: VMDDR(0.75V)



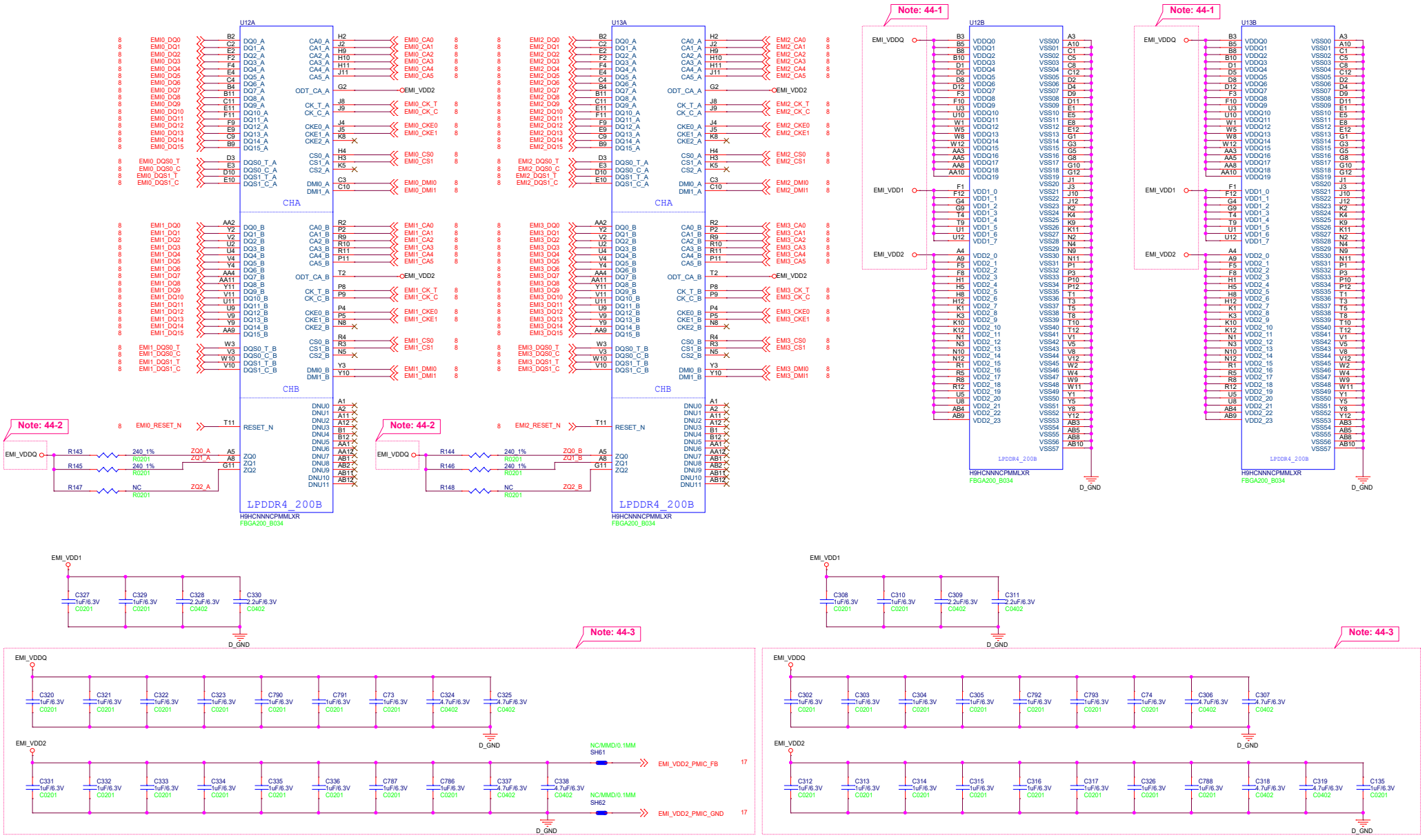


LP4X DRAM: VDD1 (1.8V)





Size: C	Title: NIO 12L		REV: X1.2
	Page Name: DC IN & Powers		
Date: Friday, December 15, 2023	Sheet 21 of 34		



Schematic design notice of "44_Memory_eMMC_LPDDR4X"

Note 44-1: Please refer to power supply related page select LDO7_VOUT / BUCK1_LX output voltage properly for LPDDR4X

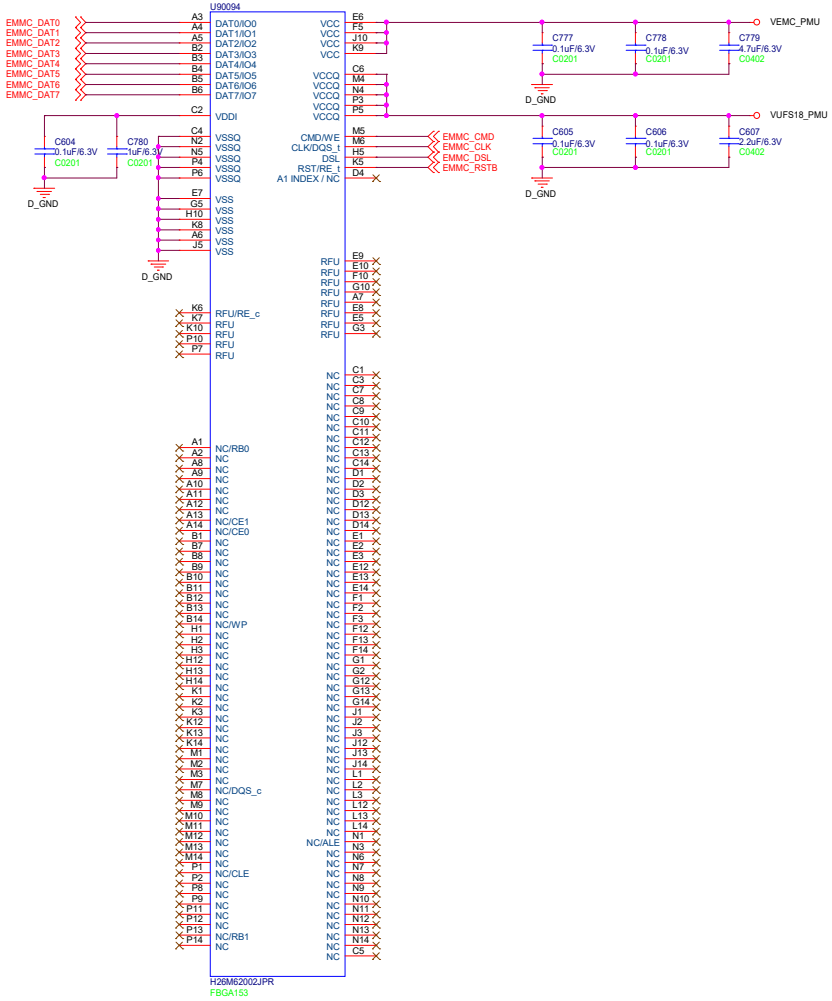
Note 44-2: DRAM ZQx resistor = 240ohm (1%) that must be connected to VDDQ,

Note 44-3: VDD2 VDDQ decoupling cap: closed to DRAM ball.
For other cap for PMIC [>10uF, at PMIC page]:
please also refer to MMD and layout guide for placement.

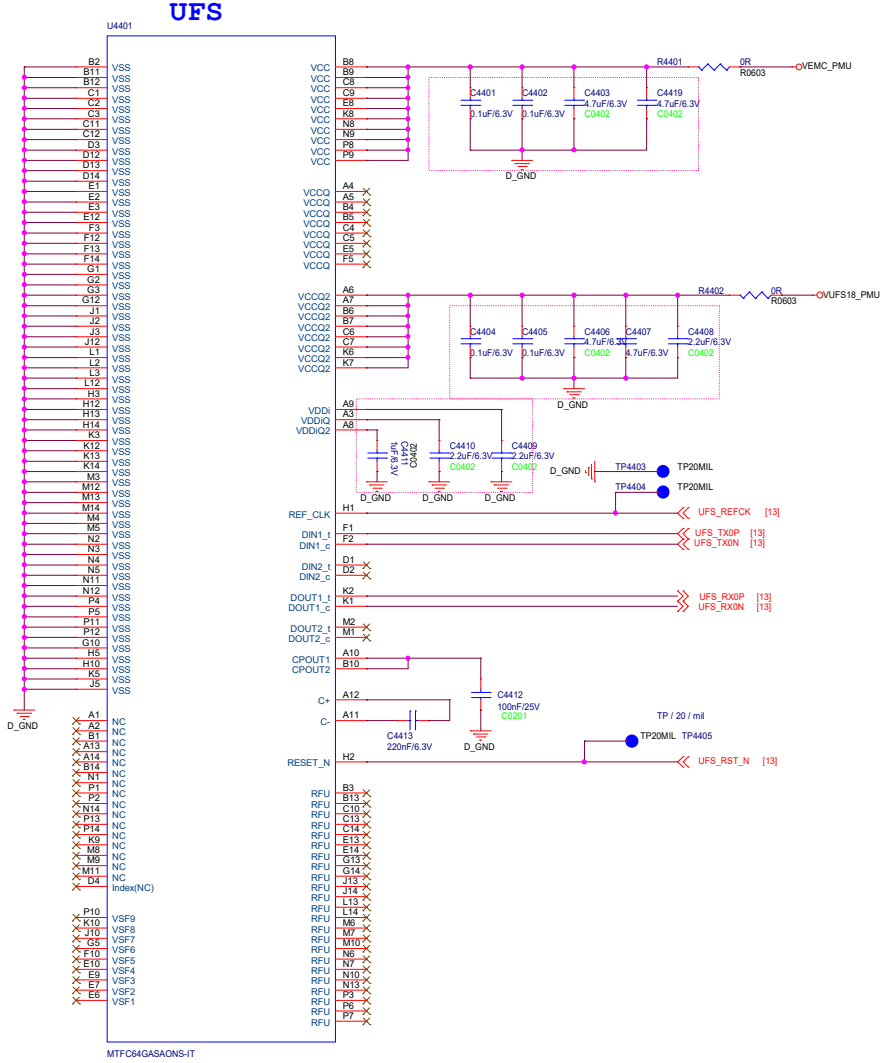
radxa

Size	Title:	REV
C	NIO 12L	
	Page Name: Memory_LPDDR4X	X1.2
Date: Friday, December 15, 2023	Sheet 22 of 34	

eMMC

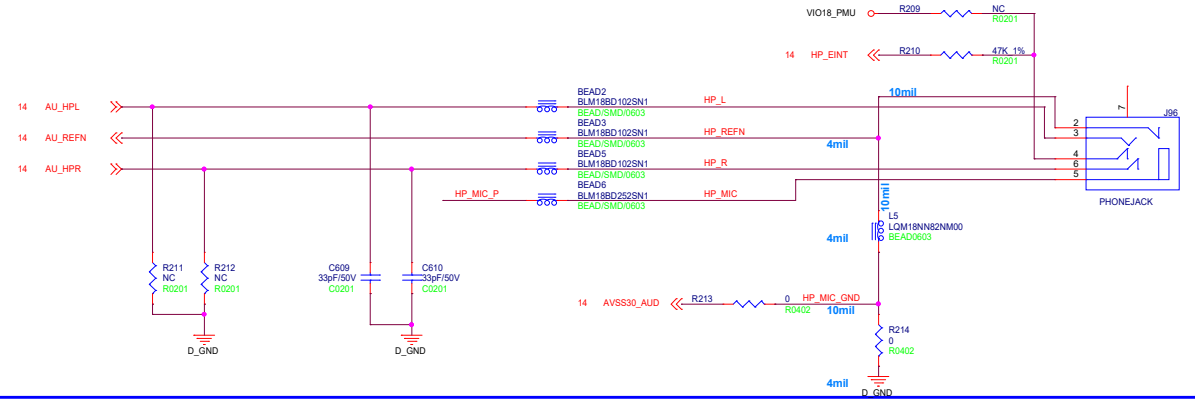


UFS

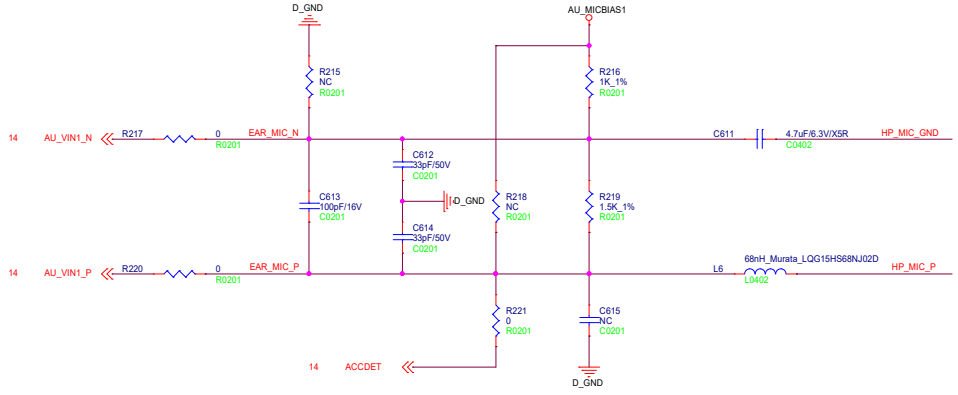


Size C	Title: NIO 12L		REV X1.2
	Page Name: Discrete_UFS		
Date: Friday, December 15, 2023	Sheet 23 of 34		

Earphone Audio (PMIC)



Earphone Microphone (PMIC)



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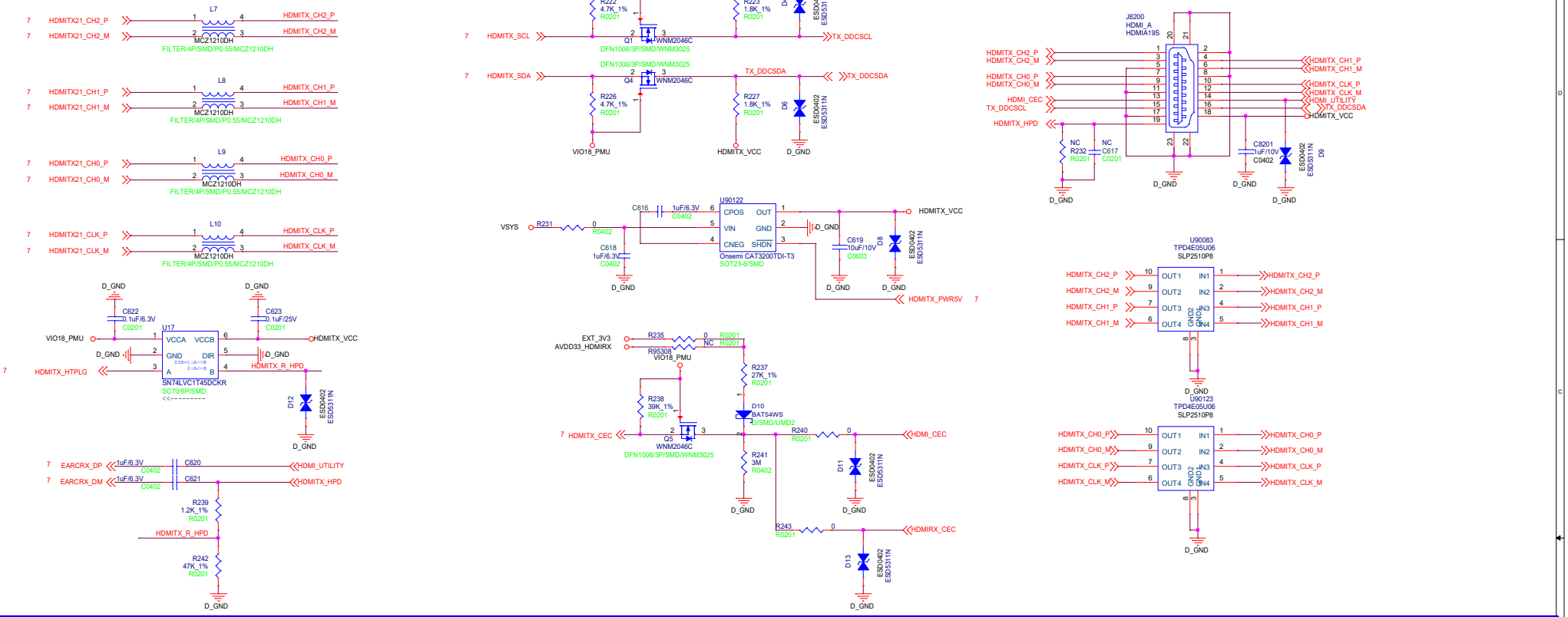
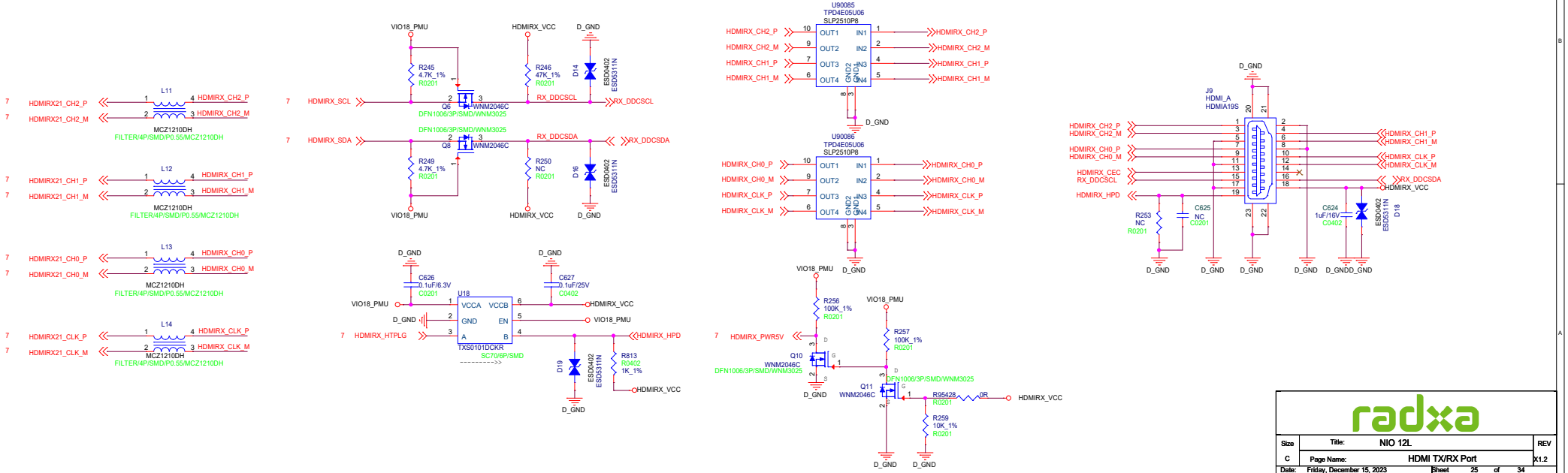
Date: Friday, December 15, 2023	Sheet 24 of 34	

HDMI TX with eARC



HDMI RX



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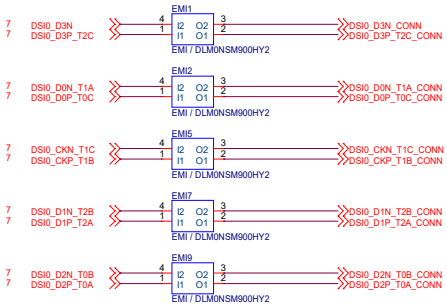
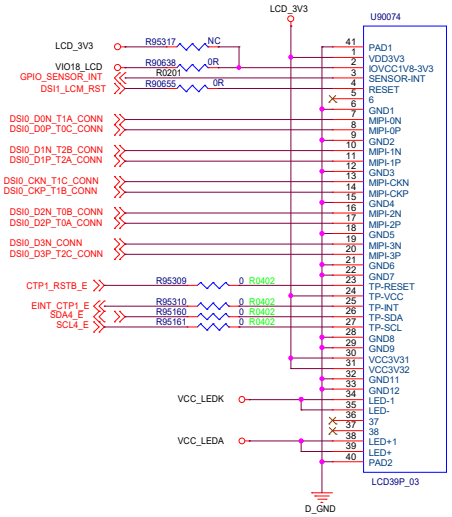
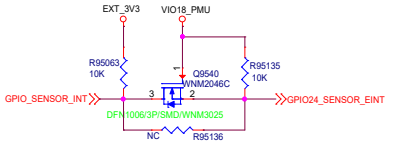
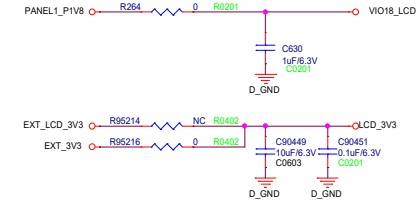
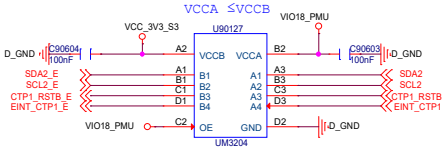
Date: Friday, December 15, 2023	Sheet 25 of 34		

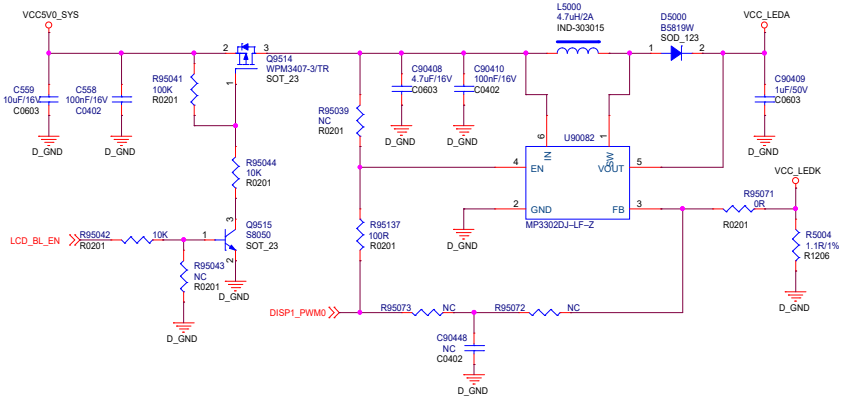












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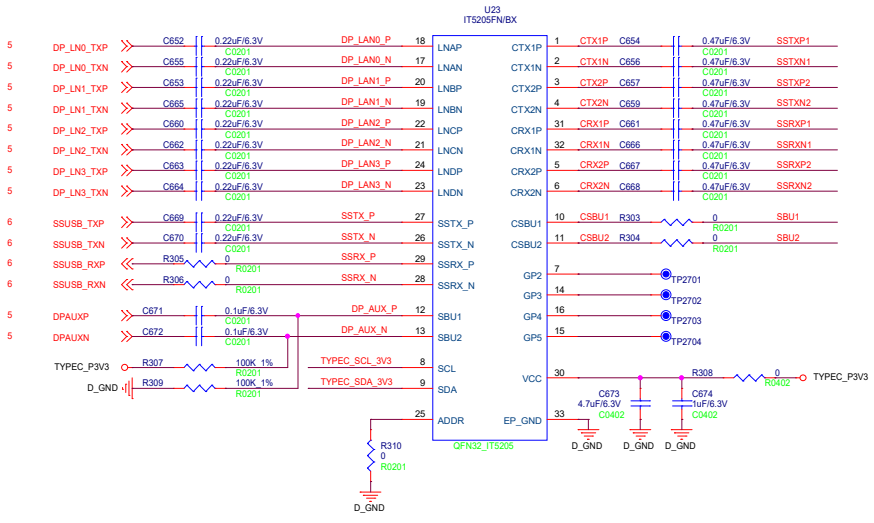
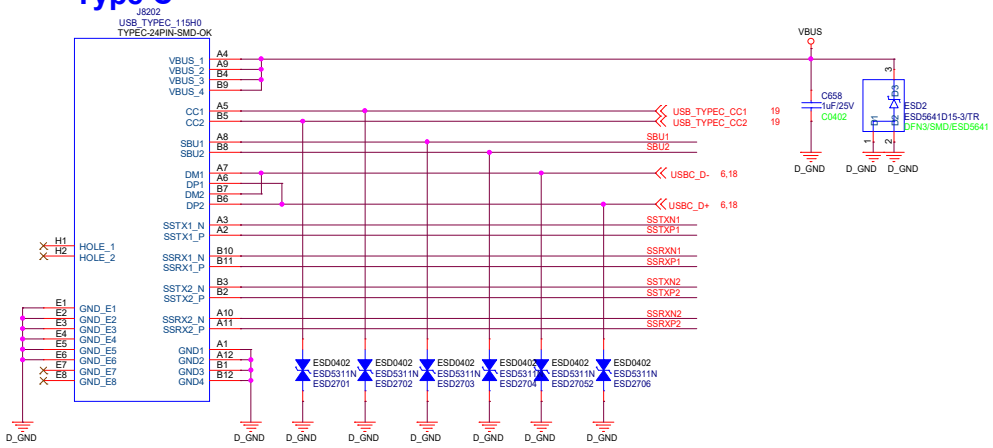
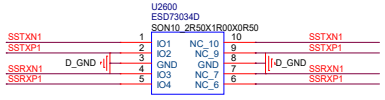
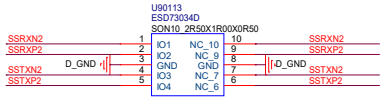
Date: Friday, December 15, 2023	Sheet 26 of 34	

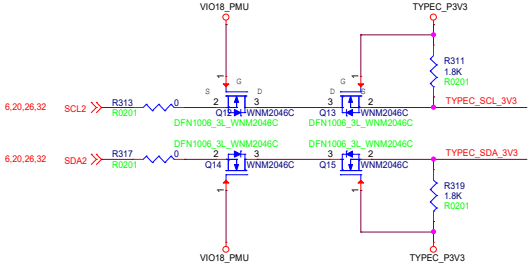
Type C

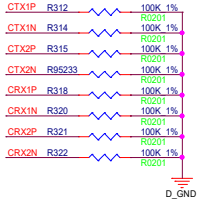


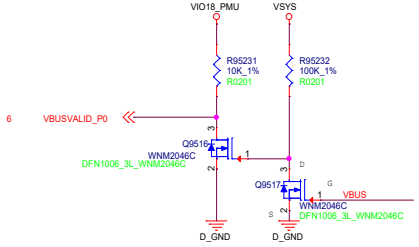












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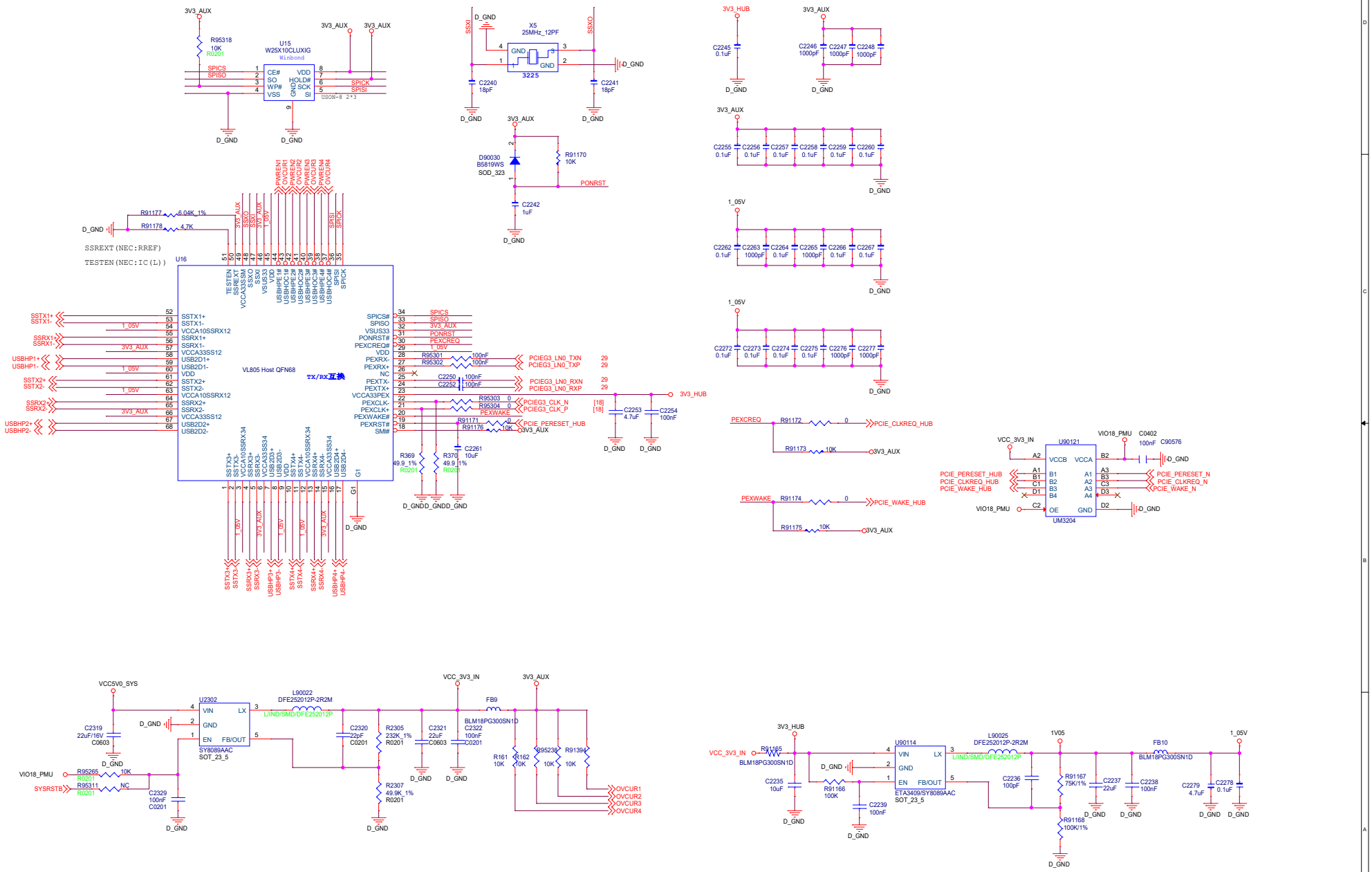
Date: Wednesday, November 01, 2023	Sheet 27 of 34	



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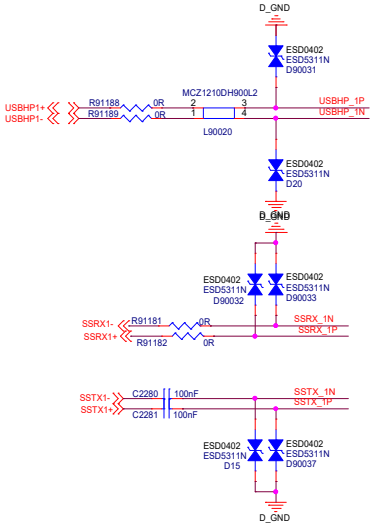
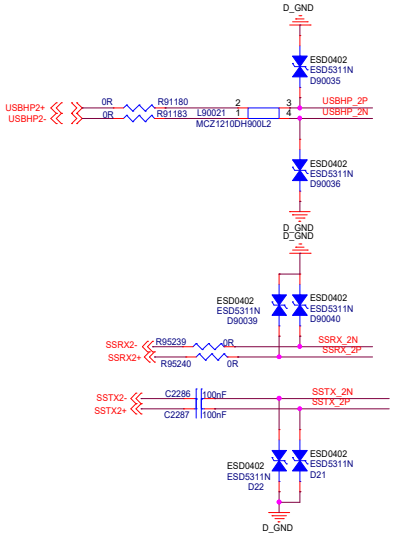
Date:	Friday, December 15, 2023	Sheet 28 of 34	





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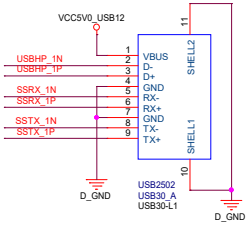

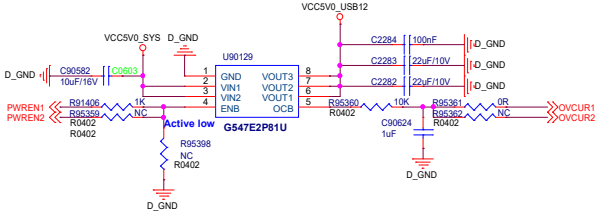

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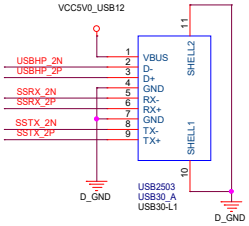

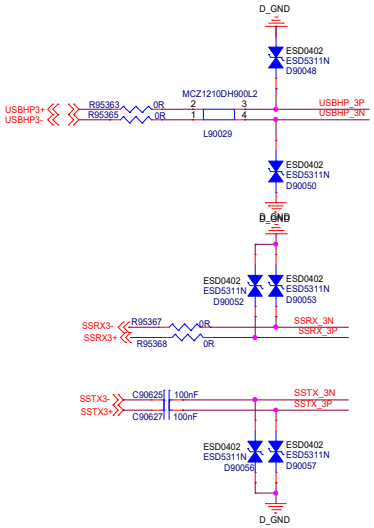

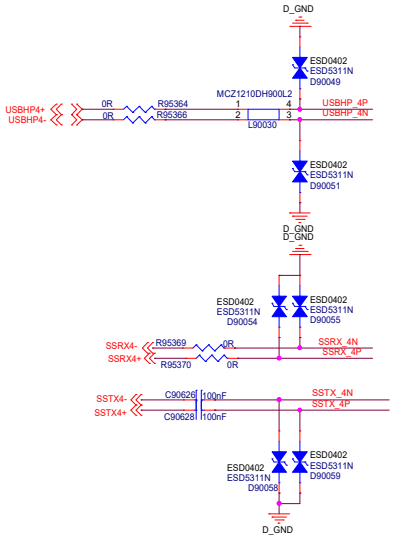

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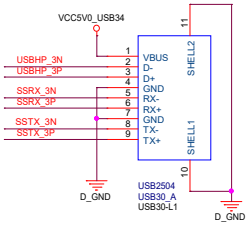

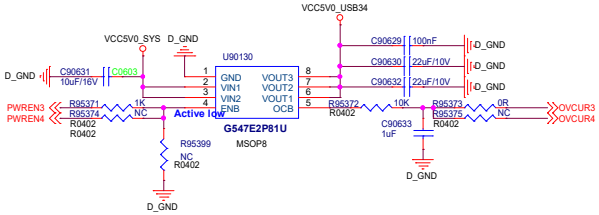

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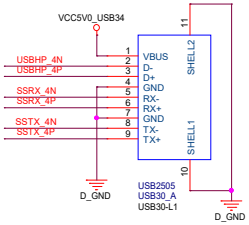

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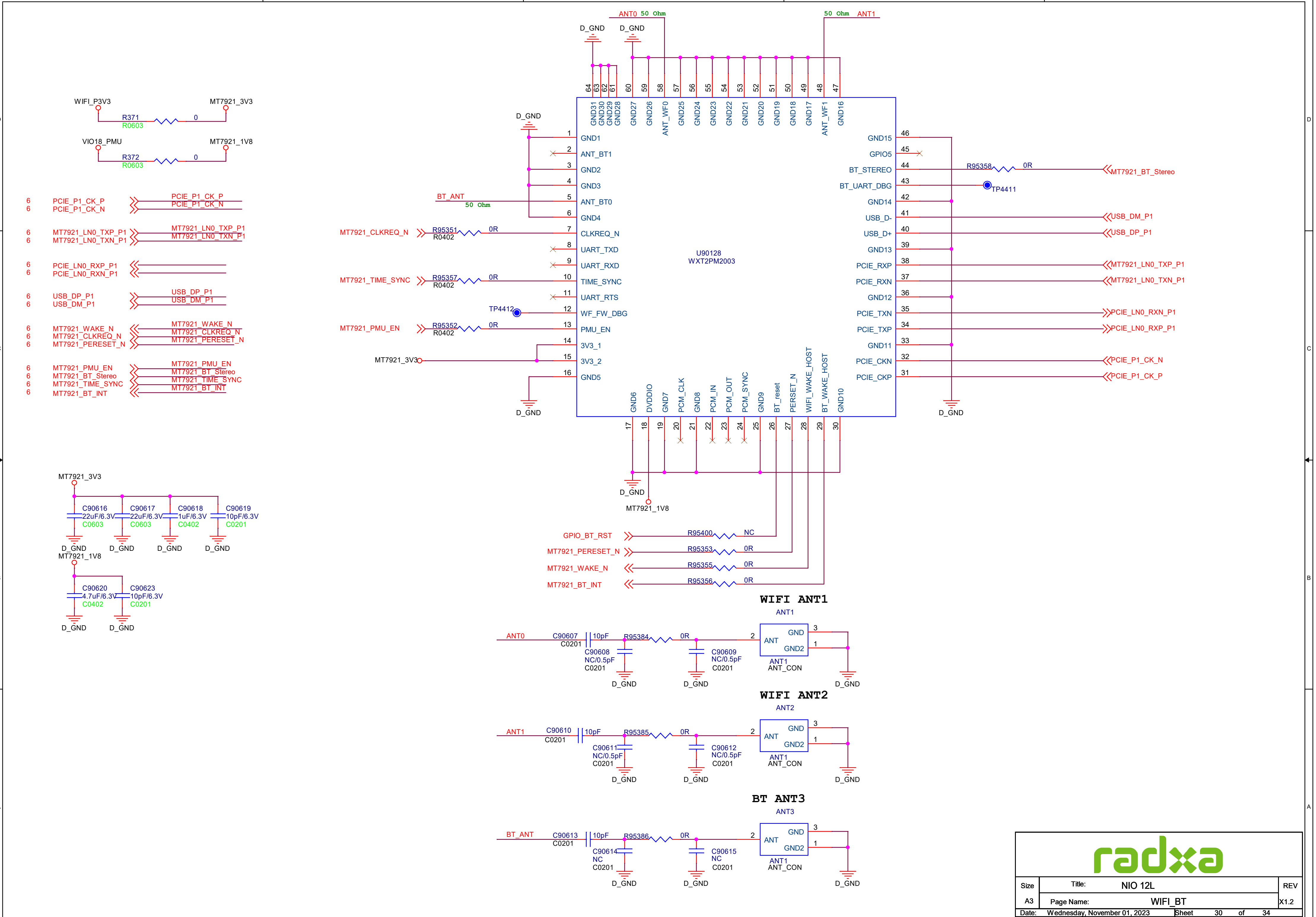
Date: Friday, December 15, 2023	Sheet 29 of 34	



WIFI_P3V3
R371
R0603
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MT7921_3V3
VIO18_PMU
R372
R0603
0
MT7921_1V8
PCIE_P1_CK_P
PCIE_P1_CK_N
MT7921_LN0_TXP_P1
MT7921_LN0_TXN_P1
PCIE_LN0_RXP_P1
PCIE_LN0_RXN_P1
USB_DP_P1
USB_DM_P1
MT7921_WAKE_N
MT7921_CLKREQ_N
MT7921_PERESET_N
MT7921_PMU_EN
MT7921_BT_Stereo
MT7921_TIME_SYNC
MT7921_BT_INT
ANT0 50 Ohm
50 Ohm ANT1
D_GND
BT_ANT
50 Ohm
MT7921_CLKREQ_N
R95351
R0402
0R
MT7921_TIME_SYNC
R95357
R0402
0R
TP4412
MT7921_PMU_EN
R95352
R0402
0R
MT7921_3V3
GND1
ANT_BT1
GND2
GND3
ANT_BT0
GND4
CLKREQ_N
UART_TXD
UART_RXD
TIME_SYNC
UART_RTS
WF_FW_DBG
PMU_EN
3V3_1
3V3_2
GND5
GND31
GND30
GND29
GND28
GND27
GND26
ANT_WF0
GND25
GND24
GND23
GND22
GND21
GND20
GND19
GND18
GND17
ANT_WF1
GND16
U90128
WXT2PM2003
GND15
GPIO5
BT_STEREO
BT_UART_DBG
GND14
USB_D-
USB_D+
GND13
PCIE_RXP
PCIE_RXN
GND12
PCIE_TXN
PCIE_TXP
GND11
PCIE_CKN
PCIE_CKP
GND6
DVDDIO
GND7
PCM_CLK
GND8
PCM_IN
PCM_OUT
PCM_SYNC
GND9
BT_reset
PERSET_N
WIFI_WAKE_HOST
BT_WAKE_HOST
GND10
R95358
0R
MT7921_BT_Stereo
TP4411
USB_DM_P1
USB_DP_P1
MT7921_LN0_TXP_P1
MT7921_LN0_TXN_P1
PCIE_LN0_RXN_P1
PCIE_LN0_RXP_P1
PCIE_P1_CK_N
PCIE_P1_CK_P
MT7921_1V8
GPIO_BT_RST
R95400
NC
MT7921_PERESET_N
R95353
0R
MT7921_WAKE_N
R95355
0R
MT7921_BT_INT
R95356
0R
C90616
22uF/6.3V
C0603
C90617
22uF/6.3V
C0603
C90618
1uF/6.3V
C0402
C90619
10pF/6.3V
C0201
C90620
4.7uF/6.3V
C0402
C90623
10pF/6.3V
C0201
WIFI ANT1
ANT1
ANT0
C90607
C0201
10pF
R95384
0R
C90608
NC/0.5pF
C0201
C90609
NC/0.5pF
C0201
ANT
GND
GND2
ANT1
ANT_CON
WIFI ANT2
ANT2
ANT1
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C0201
10pF
R95385
0R
C90611
NC/0.5pF
C0201
C90612
NC/0.5pF
C0201
BT ANT3
ANT3
BT_ANT
C90613
C0201
10pF
R95386
0R
C90614
NC
C0201
C90615
NC
C0201
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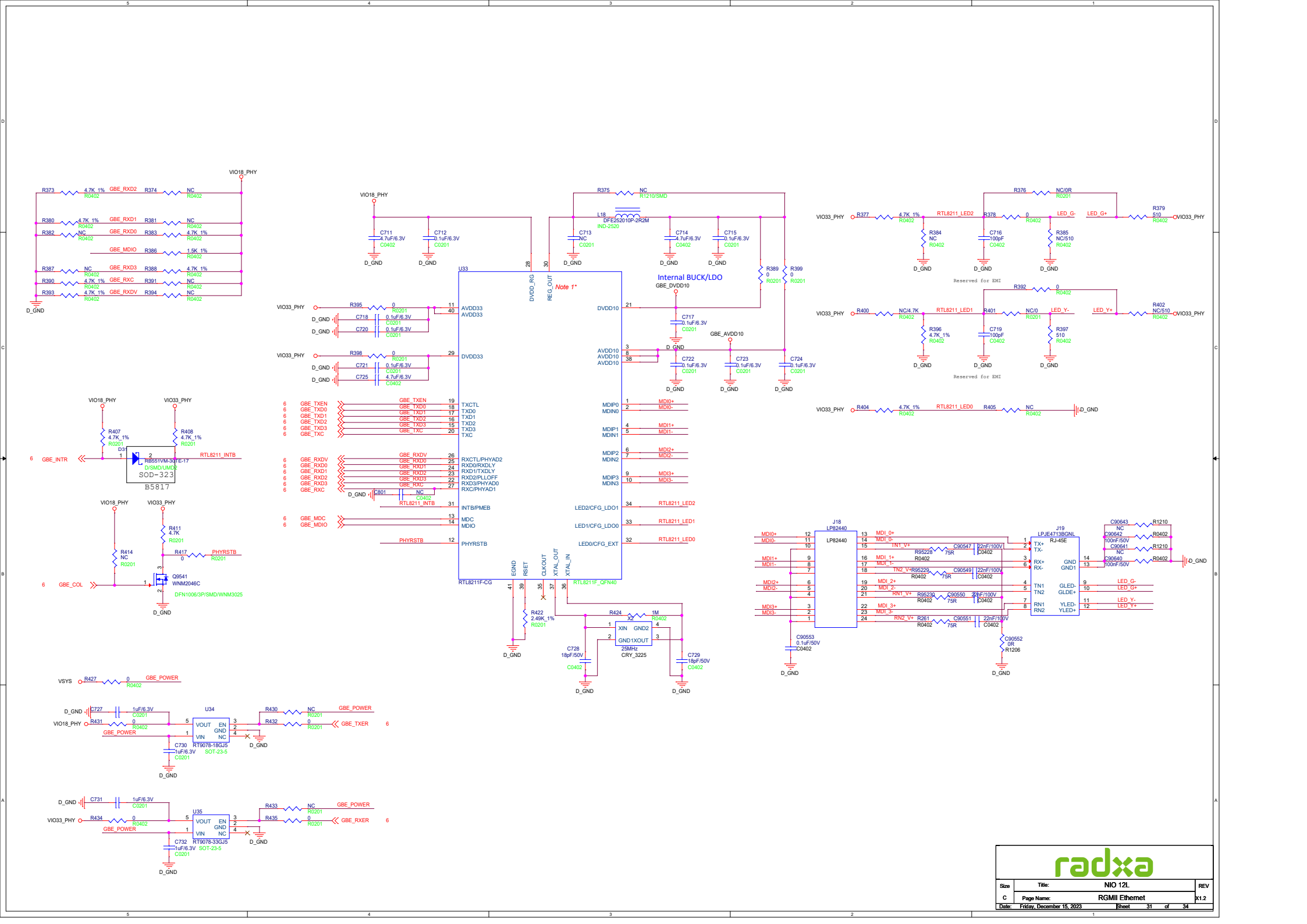
Date:
Wednesday, November 01, 2023
Sheet
30
of
34



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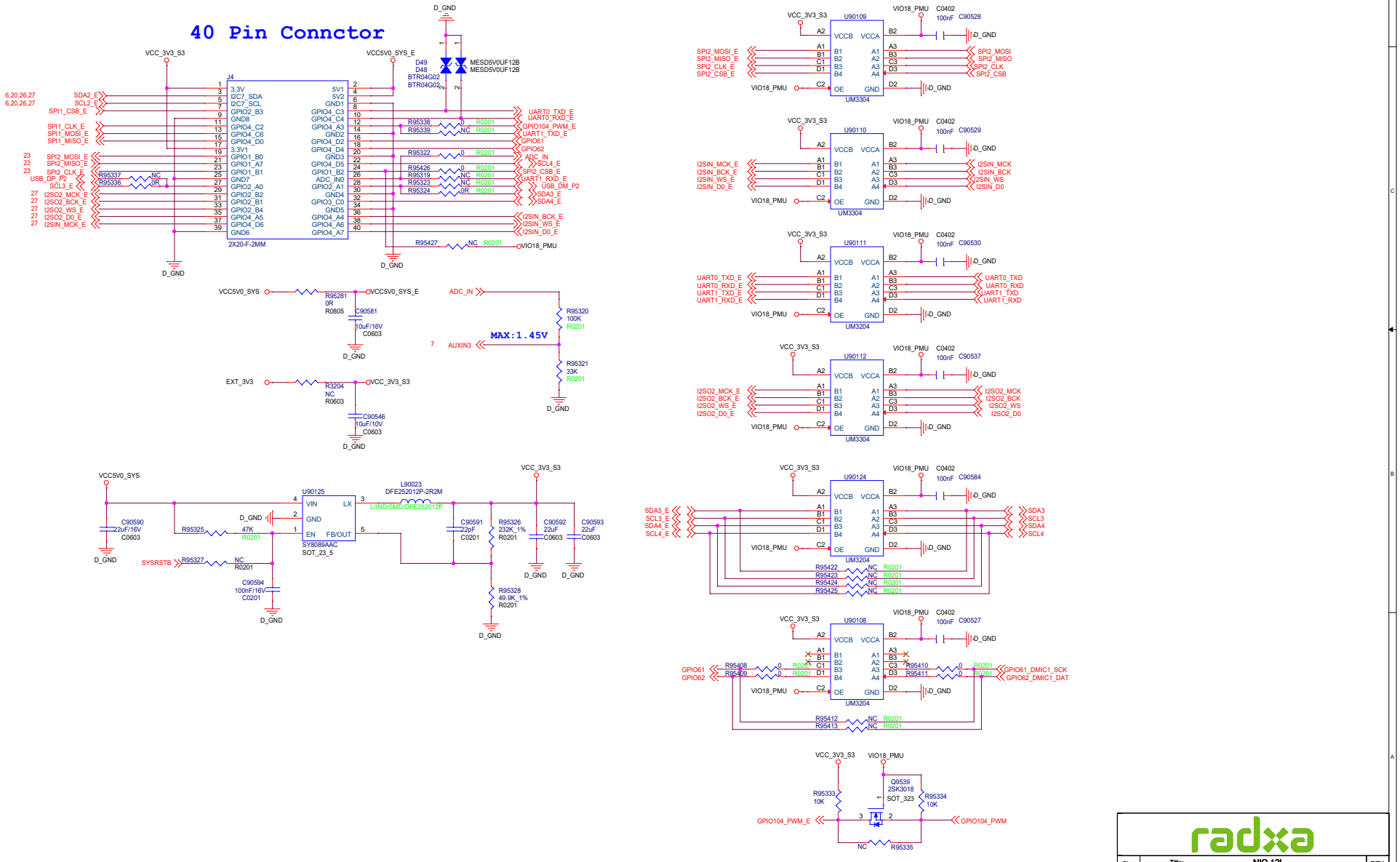
Date: Friday, December 15, 2023	Sheet 31 of 34	


40 Pin Connctor
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2X20-F-2MM
MAX:1.45V
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U90109
U90110
U90111
U90112
U90124
U90108
UM3304
UM3204
U90125
SY8089AAC
SOT_23_5
Q9539
2SK3018
SOT_323
D_GND
VCC_3V3_S3
VIO18_PMU
VCC5V0_SYS
VCC5V0_SYS_E
ADC_IN
EXT_3V3
GPIO104_PWM_E
GPIO104_PWM
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X1.2
Page Name:
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Date:
Friday, December 15, 2023
Sheet
32
of
34

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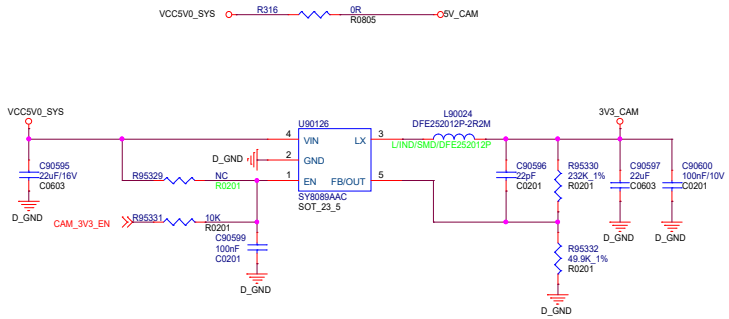

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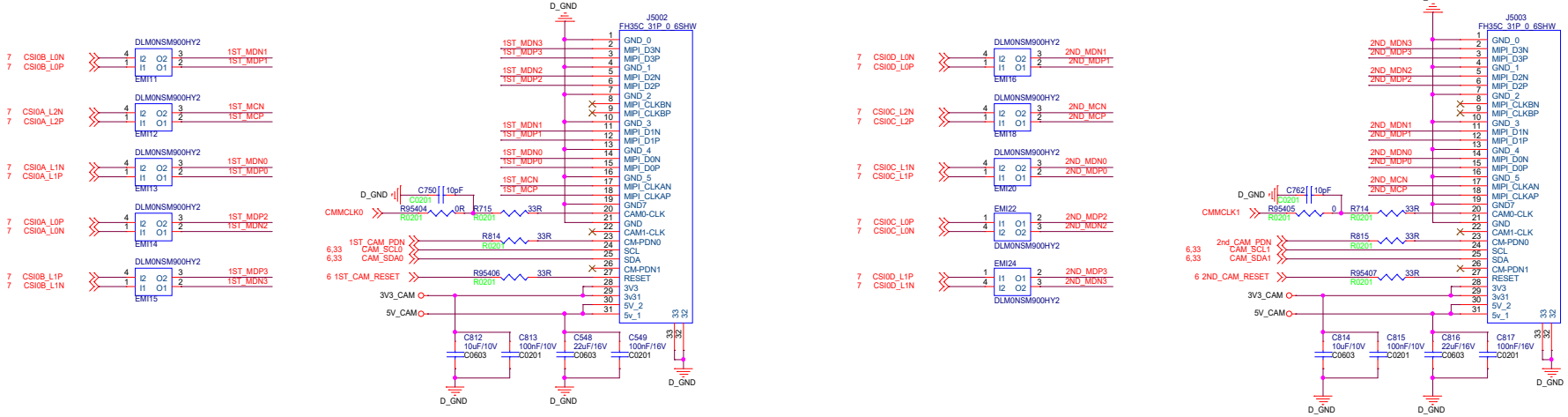

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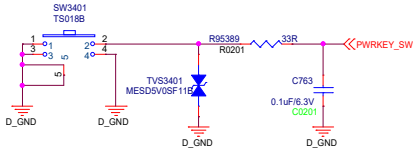
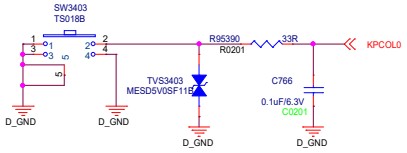
Date:	Wednesday, November 01, 2023	Sheet 33 of 34	

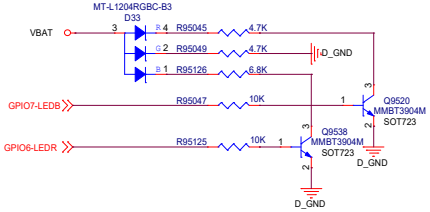
Power Key



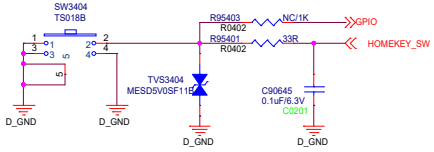
Download Key/Vol +



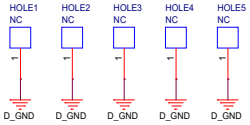
LED



Home Key/Vol -



HOLE



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Size: C	Title: NIO 12L	REV: X1.2
	Page Name: Key_LED	
Date: Wednesday, November 01, 2023	Sheet 34 of 34	