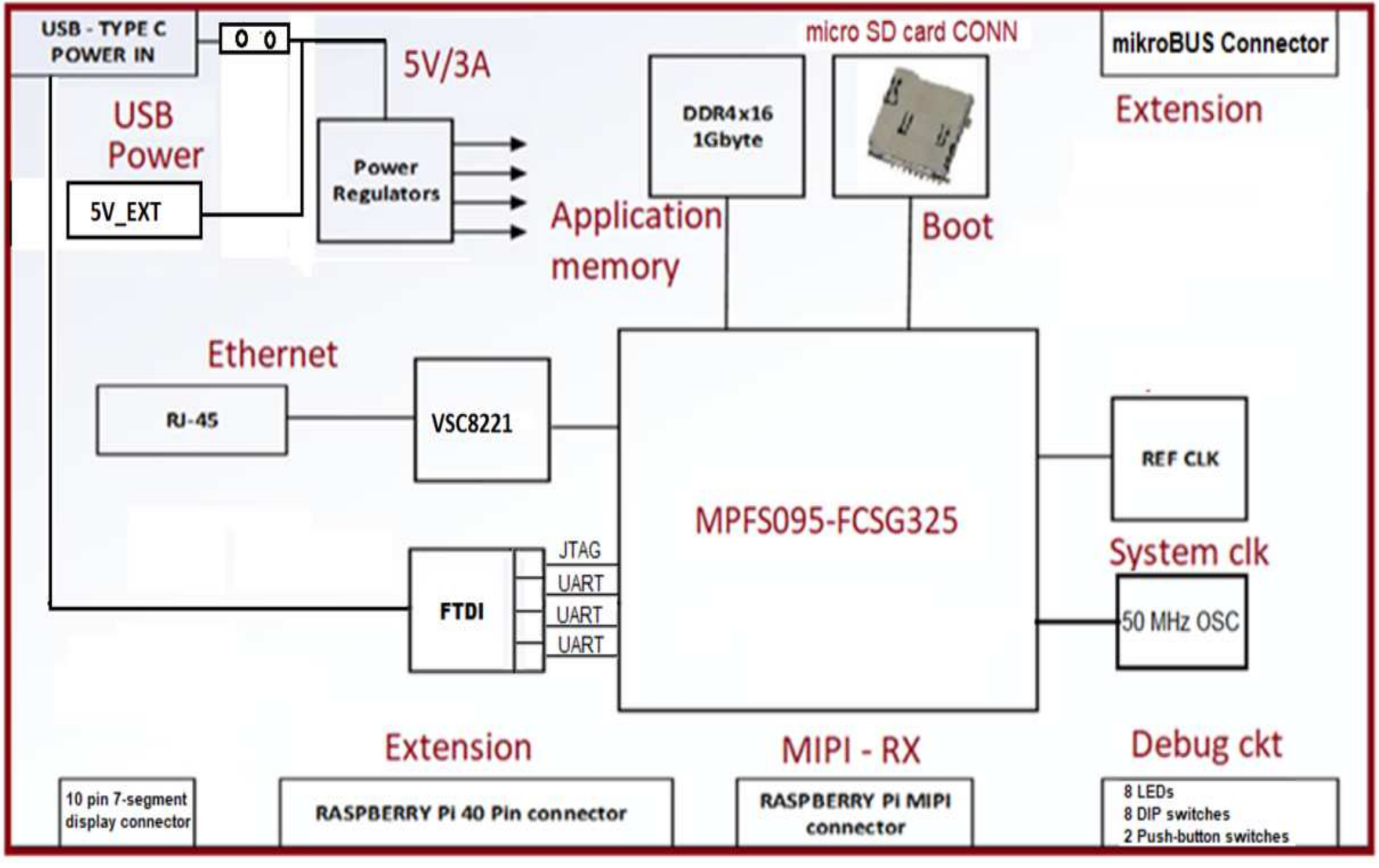
PolarFire SoC Discovery Kit

Part Number: MPFS-DISCO-KIT

MICROCHIP

Project Name: PolarFire SoC Discovery Kit		
Rev: 1.0	Part Number: DVP-100-000578-002	PACTRON:
Originator:		
Size: B	Date: Wednesday, July 26, 2023	Sheet 1 of 14



MICROCHIP

TITLE: PolarFire SoC Discovery Kit		
SIZE: B	DOCUMENT NO.	REV: 1.0
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DDR4 MEMORY

U1-5

VDDI6 = 1.2V

BANK-6 MSS DDR

MSS_DDR4_DQS_P0	AA10	MSS_DDR_DQS_P0	
MSS_DDR4_DQS_N0	Y10	MSS_DDR_DQS_N0	
MSS_DDR4_DM0	V11	MSS_DDR_DM0	
MSS_DDR4_DQ0	V10	MSS_DDR_DQ0	
MSS_DDR4_DQ1	U10	MSS_DDR_DQ1	
MSS_DDR4_DQ2	AA9	MSS_DDR_DQ2	
MSS_DDR4_DQ3	Y9	MSS_DDR_DQ3	
MSS_DDR4_DQ4	U9	MSS_DDR_DQ4	
MSS_DDR4_DQ5	R11	MSS_DDR_DQ5	
MSS_DDR4_DQ6	Y11	MSS_DDR_DQ6	
MSS_DDR4_DQ7	W11	MSS_DDR_DQ7	
MSS_DDR4_DQS_P1	V12	MSS_DDR_DQS_P1	
MSS_DDR4_DQS_N1	U12	MSS_DDR_DQS_N1	
MSS_DDR4_DM1	V13	MSS_DDR_DM1	
MSS_DDR4_DQ8	U13	MSS_DDR_DQ8	
MSS_DDR4_DQ9	R13	MSS_DDR_DQ9	
MSS_DDR4_DQ10	AA12	MSS_DDR_DQ10	
MSS_DDR4_DQ11	Y12	MSS_DDR_DQ11	
MSS_DDR4_DQ12	AA13	MSS_DDR_DQ12	
MSS_DDR4_DQ13	AA14	MSS_DDR_DQ13	
MSS_DDR4_DQ14	U14	MSS_DDR_DQ14	
MSS_DDR4_DQ15	R14	MSS_DDR_DQ15	

MSS_DDR_A0	W6	MSS_DDR4_A0	
MSS_DDR_A1	Y6	MSS_DDR4_A1	
MSS_DDR_A2	V8	MSS_DDR4_A2	
MSS_DDR_A3	AA8	MSS_DDR4_A3	
MSS_DDR_A4	AA5	MSS_DDR4_A4	
MSS_DDR_A5	Y5	MSS_DDR4_A5	
MSS_DDR_A6	U7	MSS_DDR4_A6	
MSS_DDR_A7	V7	MSS_DDR4_A7	
MSS_DDR_A8	U6	MSS_DDR4_A8	
MSS_DDR_A9	U8	MSS_DDR4_A9	
MSS_DDR_A10	Y2	MSS_DDR4_A10/AP	
MSS_DDR_A11	AA2	MSS_DDR4_A11	
MSS_DDR_A12	V1	MSS_DDR4_A12/BC_n	
MSS_DDR_A13	W1	MSS_DDR4_A13	
MSS_DDR_A14	Y3	MSS_DDR4_A14/WE_n	
MSS_DDR_A15	W2	MSS_DDR4_A15/CAS_n	
MSS_DDR_A16	AA4	MSS_DDR4_A16/RAS_n	
MSS_DDR_CK0/DDR_PLL0_OUT0	Y7	MSS_DDR4_CK0	
MSS_DDR_CK_N0	AA7	MSS_DDR4_CK_N0	
MSS_DDR_BA0	AA3	MSS_DDR4_BA0	
MSS_DDR_BA1	U5	MSS_DDR4_BA1	
MSS_DDR_BG0	U1	MSS_DDR4_BG0	
MSS_DDR_BG1	U2		
MSS_DDR_CS0	U4	MSS_DDR4_CS0	
MSS_DDR_CKE0	R1	MSS_DDR4_CKE0	
MSS_DDR_ODT0	T2	MSS_DDR4_ODT0	
MSS_DDR_ACT_N	T5	MSS_DDR4_ACT_N	
MSS_DDR3_WE_N	V5		
MSS_DDR_VREF_IN	R9	MSS_DDR4_VREF_IN	
MSS_DDR_ALERT_N	R4	MSS_DDR4_ALERT_N	
MSS_DDR_RAM_RST_N/DDR_PLL0_OUT1	T3	MSS_DDR4_RAM_RST_N	
MSS_DDR_PARITY	T4	MSS_DDR4_PARITY	

MPFS095T-1FCSG325E

0P6V_VREF_DDR4

R175 0R MSS_DDR4_VREF_IN

C127 0.1uF/16V BGA0201

MSS_DDR4_RAM_RST_N

U2

DDR4 512 Meg x 16

MSS_DDR4_DQ0	G2	DQ0	
MSS_DDR4_DQ1	F7	DQ1	
MSS_DDR4_DQ2	H3	DQ2	
MSS_DDR4_DQ3	H7	DQ3	
MSS_DDR4_DQ4	H2	DQ4	
MSS_DDR4_DQ5	H8	DQ5	
MSS_DDR4_DQ6	J3	DQ6	
MSS_DDR4_DQ7	J7	DQ7	
MSS_DDR4_DQ8	A3	DQ8	
MSS_DDR4_DQ9	B8	DQ9	
MSS_DDR4_DQ10	C3	DQ10	
MSS_DDR4_DQ11	C7	DQ11	
MSS_DDR4_DQ12	C2	DQ12	
MSS_DDR4_DQ13	C8	DQ13	
MSS_DDR4_DQ14	D3	DQ14	
MSS_DDR4_DQ15	D7	DQ15	
MSS_DDR4_DQS_P1	B7	UDQS_T	
MSS_DDR4_DQS_N1	A7	UDQS_C	
MSS_DDR4_DQS_P0	G3	LDQS_T	
MSS_DDR4_DQS_N0	F3	LDQS_C	
MSS_DDR4_DM1	E2	NF/UDM_N/UDBI_N	
MSS_DDR4_DM0	E7	NF/LDM_N/LDBI_N	
MSS_DDR4_A0	P3	A0	
MSS_DDR4_A1	P7	A1	
MSS_DDR4_A2	R3	A2	
MSS_DDR4_A3	N7	A3	
MSS_DDR4_A4	N3	A4	
MSS_DDR4_A5	P8	A5	
MSS_DDR4_A6	P2	A6	
MSS_DDR4_A7	R8	A7	
MSS_DDR4_A8	R2	A8	
MSS_DDR4_A9	R7	A9	
MSS_DDR4_A10/AP	M3	A10/AP	
MSS_DDR4_A11	T2	A11	
MSS_DDR4_A12/BC_n	M7	A12_BC_N	
MSS_DDR4_A13	T8	A13	
MSS_DDR4_A14/WE_n	L2	WE_N/A14	
MSS_DDR4_A15/CAS_n	M8	CAS_N/A15	
MSS_DDR4_A16/RAS_n	L8	RAS_N/A16	
	T7	NC	
MSS_DDR4_BA0	N2	BA0	
MSS_DDR4_BA1	N8	BA1	
MSS_DDR4_BG0	M2	BG0	
MSS_DDR4_ODT0	K3	ODT	
MSS_DDR4_CK0	K7	CK_T	
MSS_DDR4_CK_N0	K8	CK_C	
MSS_DDR4_CKE0	K2	CKE	
MSS_DDR4_CS0	L7	CS_N	
R26 240R/1%	F9	ZQ	
MSS_DDR4_ALERT_N	P9	ALERT_N	
MSS_DDR4_PARITY	T3	PAR	
MSS_DDR4_RAM_RST_N	P1	RESET_N	
MSS_DDR4_ACT_N	L3	ACT_N	
MSS_DDR4_TEN	N9	TEN	
0P6V_VREF_DDR4	M1	VREFCA	

C23 0.1uF/16V C24 0.01uF/16V

VDD_1	B3	1P2V_DDR4	
VDD_2	B9		
VDD_3	D1		
VDD_4	G7		
VDD_5	J1		
VDD_6	J9		
VDD_7	L1		
VDD_8	L9		
VDD_9	R1		
VDD_10	T9		
VDDQ_1	A1		
VDDQ_2	A9		
VDDQ_3	C1		
VDDQ_4	D9		
VDDQ_5	F2		
VDDQ_6	F8		
VDDQ_7	G1		
VDDQ_8	G9		
VDDQ_9	J2		
VDDQ_10	J8		
VPP_1	B1	2P5V	
VPP_2	R9		
VSS_1	B2		
VSS_2	E1		
VSS_3	E9		
VSS_4	G8		
VSS_5	K1		
VSS_6	K9		
VSS_7	M9		
VSS_8	N1		
VSS_9	T1		
VSSQ_1	A2		
VSSQ_2	A8		
VSSQ_3	C9		
VSSQ_4	D2		
VSSQ_5	D8		
VSSQ_6	E3		
VSSQ_7	E8		
VSSQ_8	F1		
VSSQ_9	H1		
VSSQ_10	H9		

MT40A512M16TB-062E:R
Part Number = MT40A512M16TB-062E:R
Manufacturer = Micron Technology Inc

VTT TERMINATION

0P6V_VTT_DDR4

MSS_DDR4_A0	R1	39R/5%	C2	0.1uF/16V
MSS_DDR4_A1	R2	39R/5%		
MSS_DDR4_A2	R3	39R/5%	C3	0.1uF/16V
MSS_DDR4_A3	R4	39R/5%		
MSS_DDR4_A4	R5	39R/5%	C4	0.1uF/16V
MSS_DDR4_A5	R6	39R/5%		
MSS_DDR4_A6	R7	39R/5%	C5	0.1uF/16V
MSS_DDR4_A7	R8	39R/5%		
MSS_DDR4_A8	R9	39R/5%	C6	0.1uF/16V
MSS_DDR4_A9	R10	39R/5%		
MSS_DDR4_A10/AP	R11	39R/5%	C7	0.1uF/16V
MSS_DDR4_A11	R12	39R/5%		
MSS_DDR4_A12/BC_n	R13	39R/5%	C8	0.1uF/16V
MSS_DDR4_A13	R14	39R/5%		
MSS_DDR4_A14/WE_n	R15	39R/5%	C9	0.1uF/16V
MSS_DDR4_A15/CAS_n	R16	39R/5%		
MSS_DDR4_A16/RAS_n	R681	39R/5%	C10	0.1uF/16V
MSS_DDR4_ACT_N	R18	39R/5%		
MSS_DDR4_PARITY	R19	39R/5%	C11	0.1uF/16V
			C12	0.1uF/16V
MSS_DDR4_BA0	R20	39R/5%		
MSS_DDR4_BA1	R21	39R/5%	C13	0.1uF/16V
MSS_DDR4_BG0	R22	39R/5%	C14	0.1uF/16V
			C15	0.1uF/16V
MSS_DDR4_ODT0	R23	39R/5%	C16	0.1uF/16V
MSS_DDR4_CKE0	R24	39R/5%	C17	0.1uF/16V
			C18	0.1uF/16V
MSS_DDR4_CS0	R25	39R/5%	C19	0.1uF/16V
			C20	0.1uF/16V
			C21	10uF/10V

C0603 C1 10uF/10V

R0201 C0201

1P2V_DDR4

MSS_DDR4_ALERT_N R27 4.7K R0201

1P2V_DDR4

MSS_DDR4_CK0 R29 39R/5% C22 0.1uF/16V
MSS_DDR4_CK_N0 R30 39R/5%

1P2V_DDR4

R34 10K_NL

MSS_DDR4_TEN

R35 10K

DDR DECPAS

1P2V_DDR4

C0201

C25	0.01uF/16V
C26	0.01uF/16V
C27	0.01uF/16V
C28	0.01uF/16V
C29	0.01uF/16V
C30	0.01uF/16V
C31	0.01uF/16V
C32	0.01uF/16V
C33	0.01uF/16V
C34	0.01uF/16V

C0201

C35	0.1uF/16V
C36	0.1uF/16V
C37	0.1uF/16V
C38	0.1uF/16V
C39	0.1uF/16V
C40	0.1uF/16V
C41	0.1uF/16V
C42	0.1uF/16V
C43	0.1uF/16V
C44	0.1uF/16V

C0603 C211 10uF/10V

2P5V

C46 0.01uF/16V
C47 0.1uF/16V

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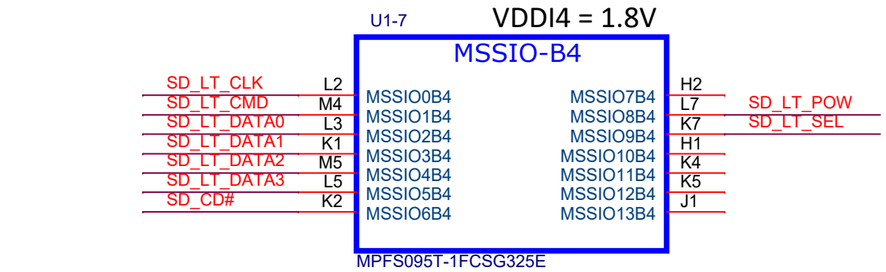
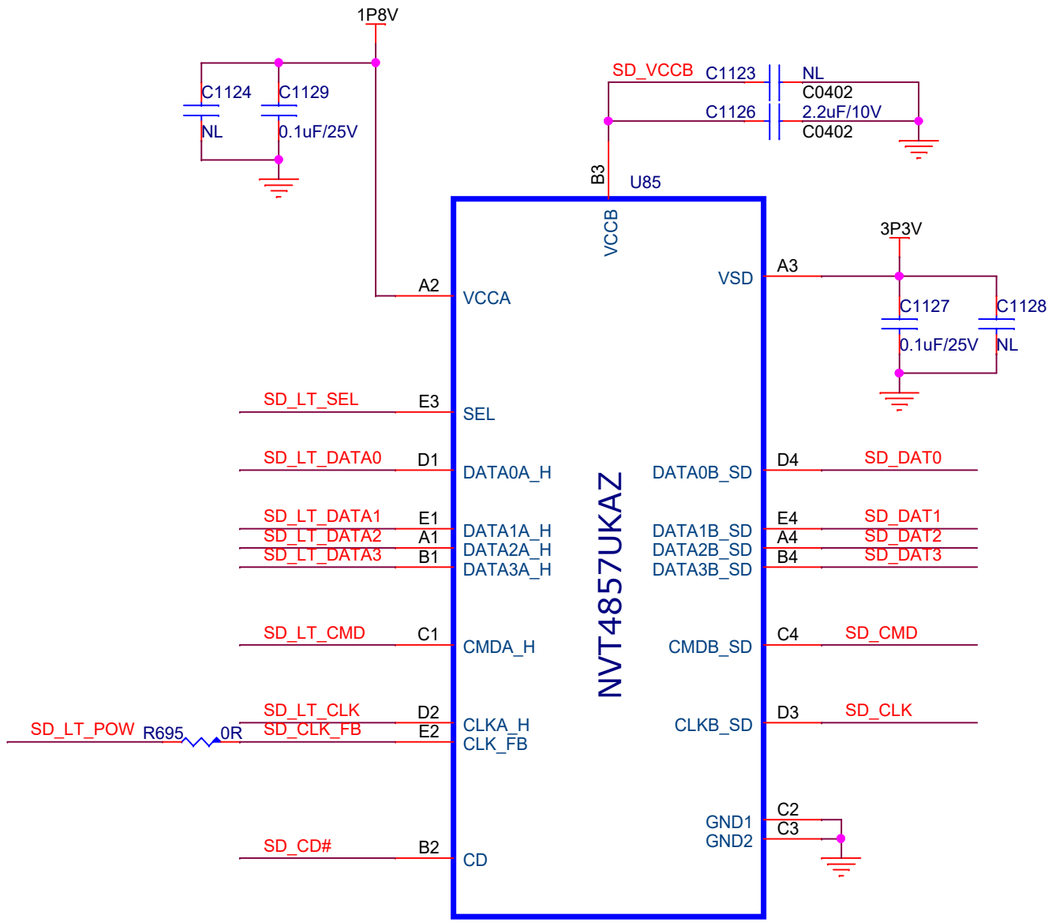
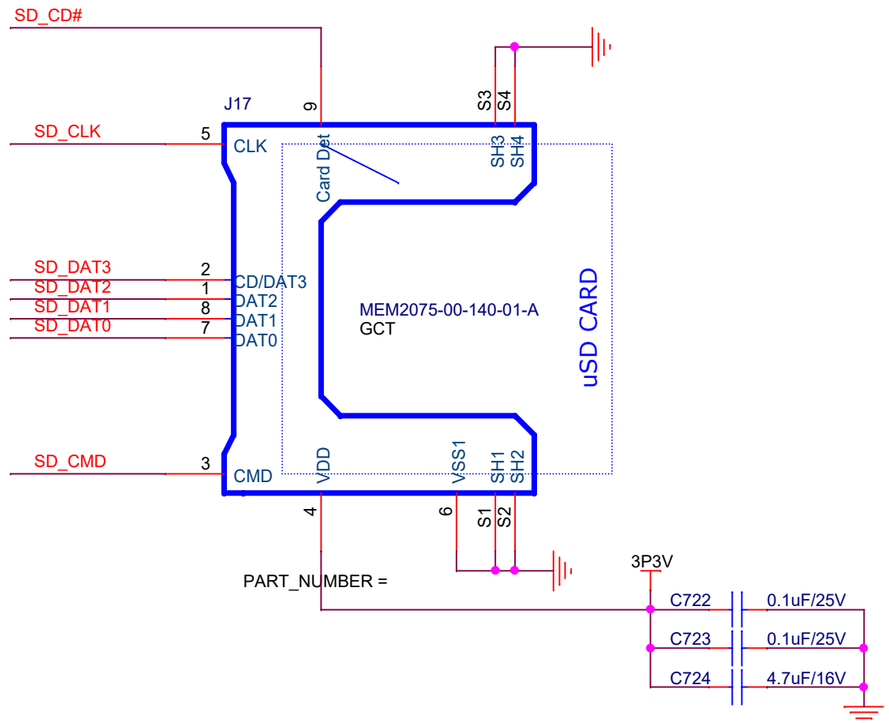
BANK4- uSD Conneciton







MICROCHIP

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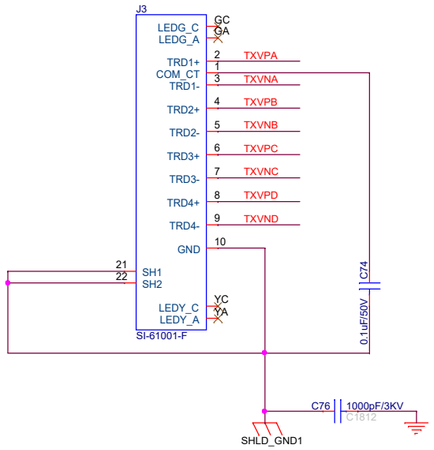
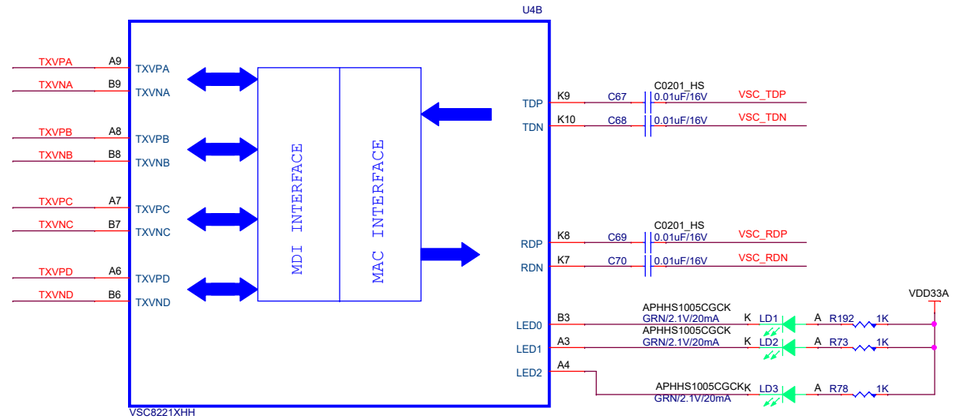
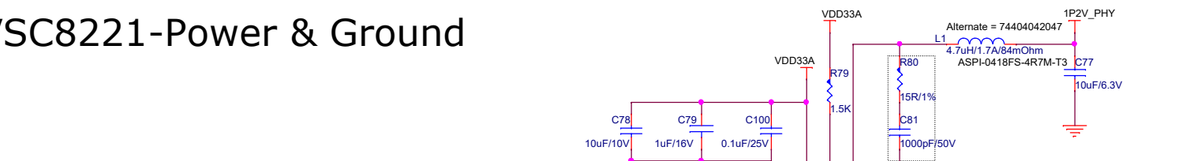
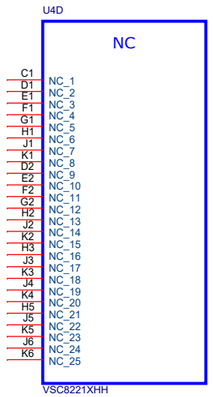
VSC8221 - SGMII Interface

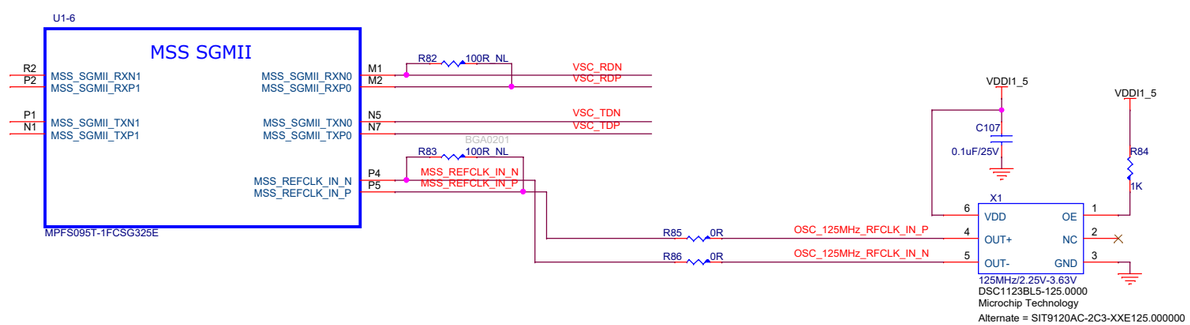


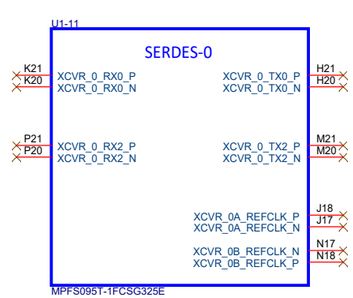


VSC8221-Power & Ground









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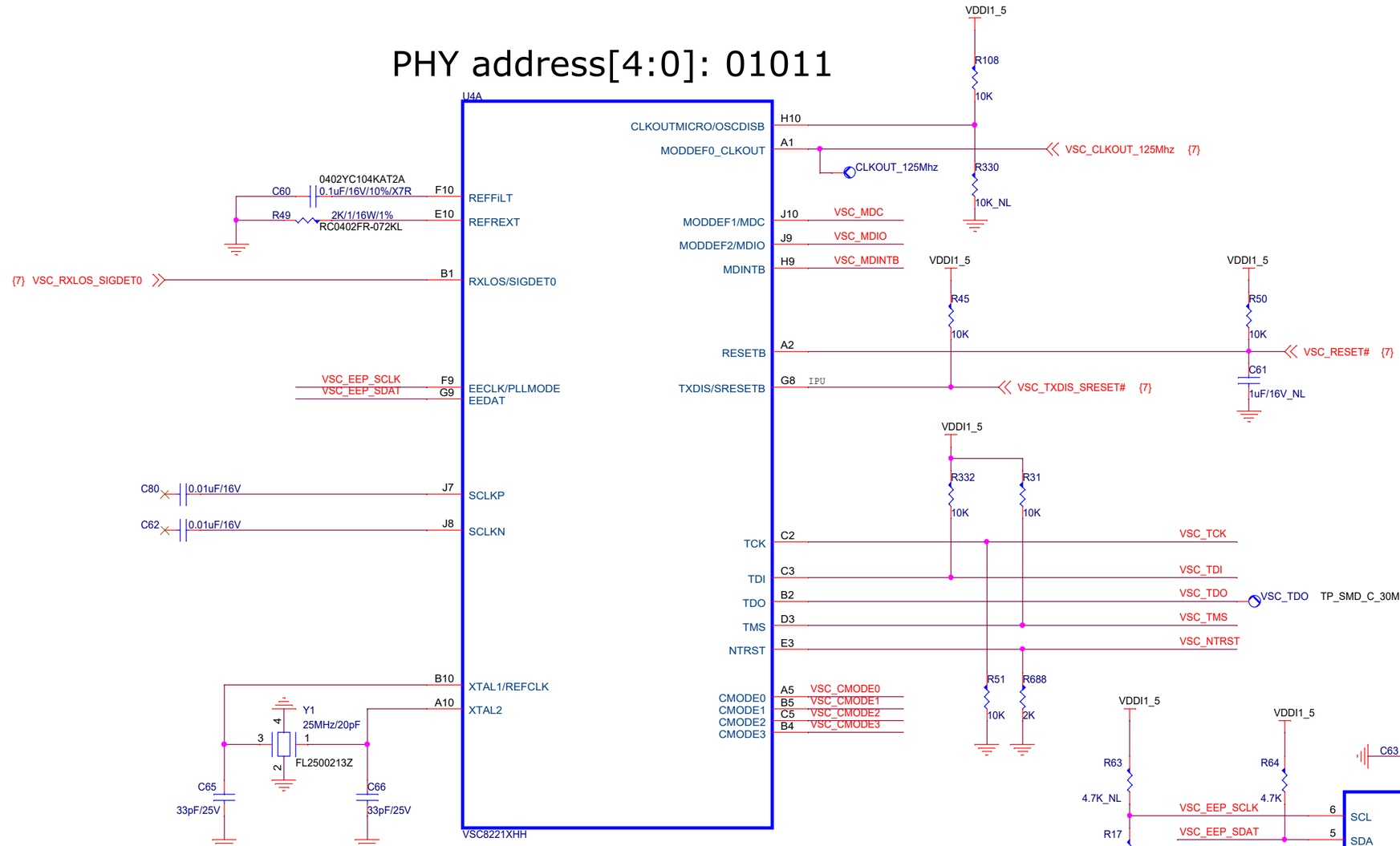
VSC8221 - Connection

PHY address[4:0]: 01011



I2C Address AT24CM01: 1010000(R/W#)

	bit 3	bit 2	bit 1	bit 0	Connection
CMODE 0	Phy address[3]	Phy address[2]	Phy address[1]	Phy address[0]	
	1	0	1	1	5.90k tied to VDD33A
CMODE1	SFP Mode Disable	PHY Address[4]	SiGDET pin direction	SerDes Line impedance	
	1	0	1	0	4.02k tied to VDD33A
CMODE 2	PHY Operating Mode[3]	PHY Operating Mode[2]	PHY Operating Mode[1]	PHY Operating Mode[0]	
	1	1	1	1	22.6k tied to VDD33A
CMODE3	LED Control[1]	SQE Enable	Reserved	Auto-negotiation Advertisement Control[1]	
	1	0	0	0	0k tied to VDD33A
	LED[2:0] = {Link/Activity, Link/Activity, Fault}			10/100/1000BASE-T HDX, FDX	

LAYOUT NOTE FOR RC CIRCUIT R49 & C60:

The ground connections of the resistor and the capacitor should each be connected to a shared PCB signal trace, rather than being connected individually to common ground plane. This PCB signal trace should then be connected to a ground plane at a single point. In addition, the reference capacitor and resistor should be placed as close as possible to the VSC8221

MICROCHIP

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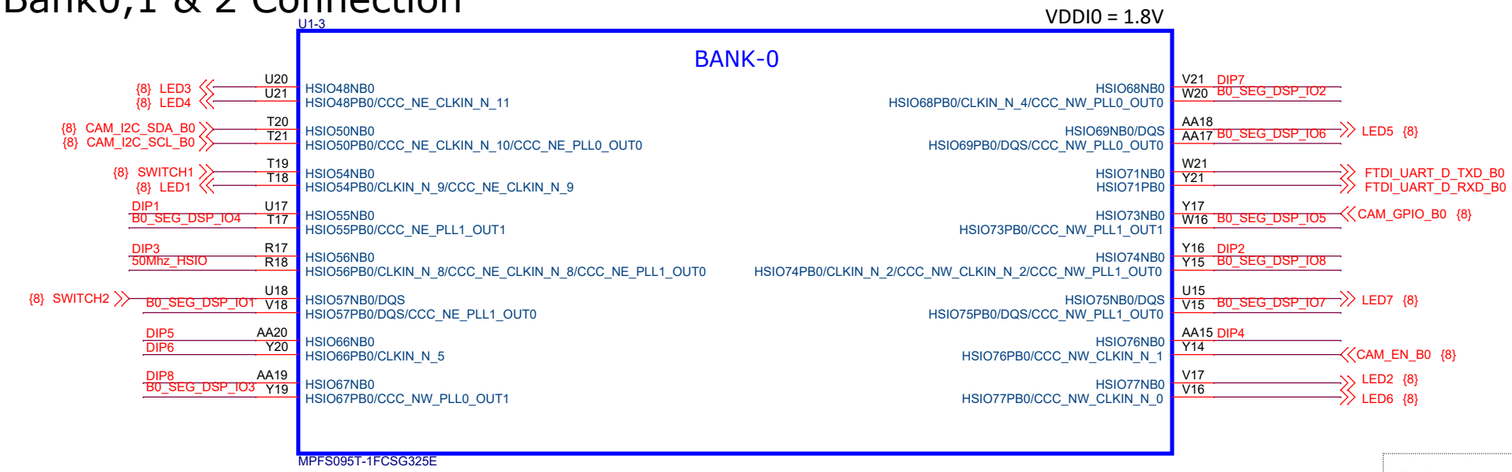
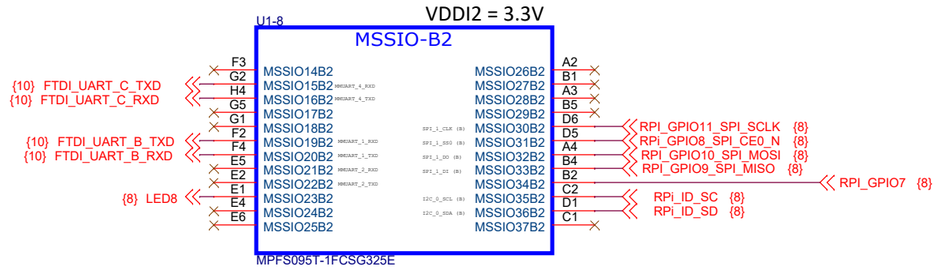
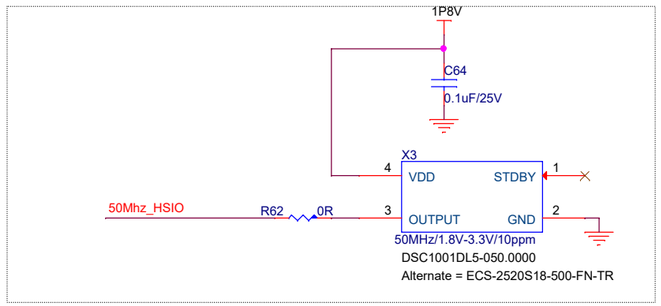
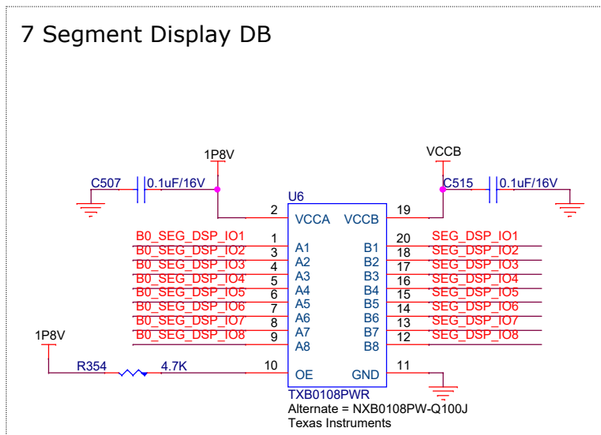
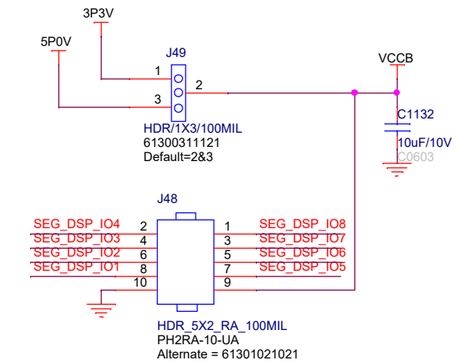
Bank0,1 & 2 Connection

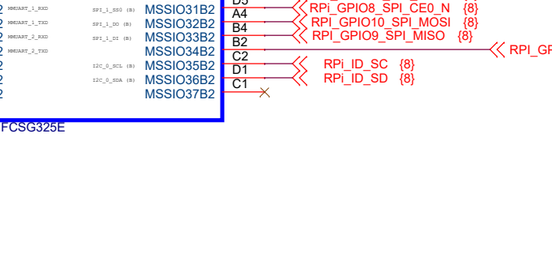


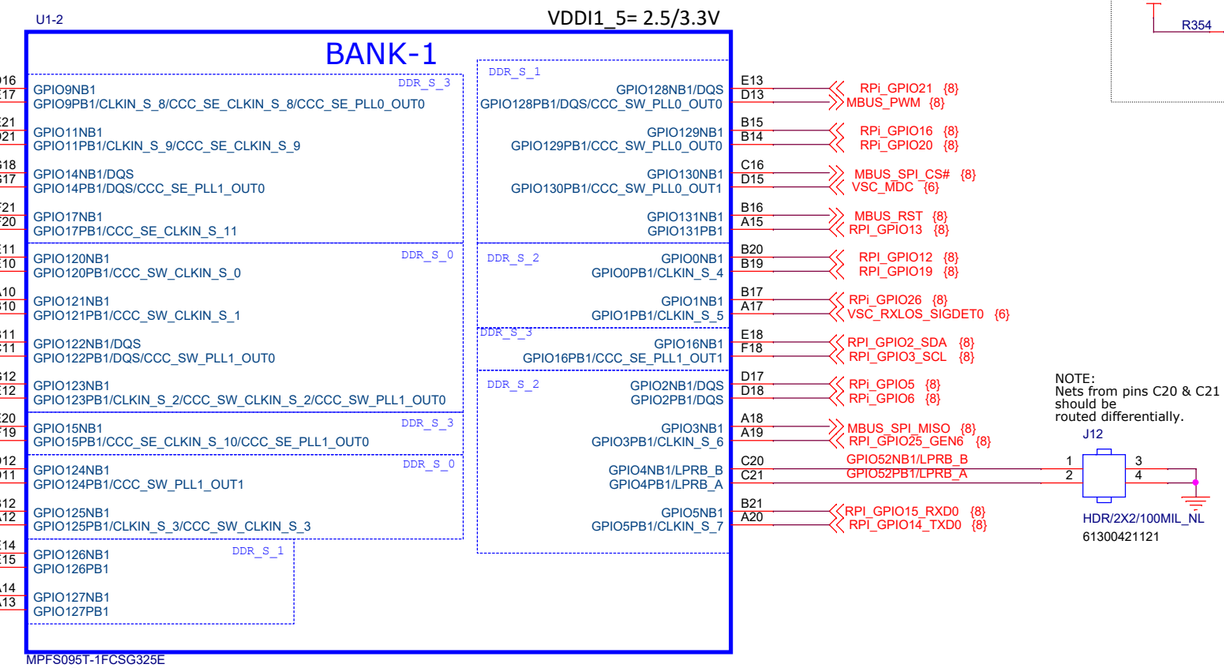












NOTE:
Nets from pins C20 & C21 should be routed differentially.

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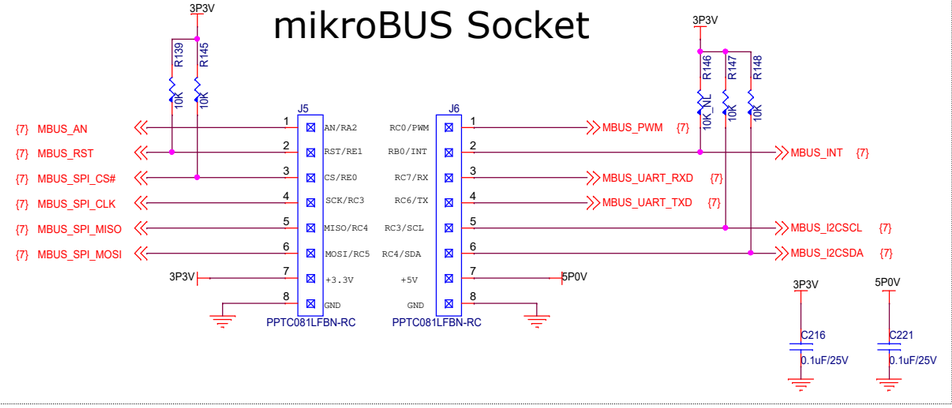
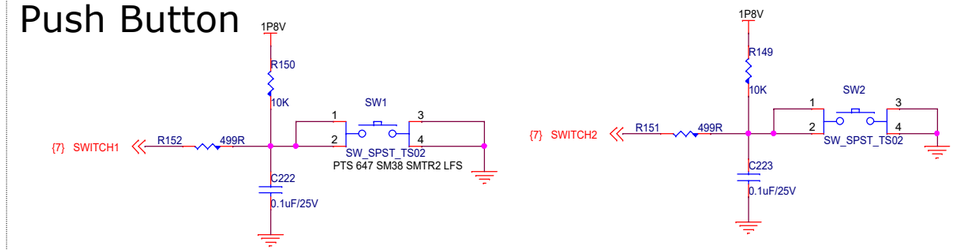
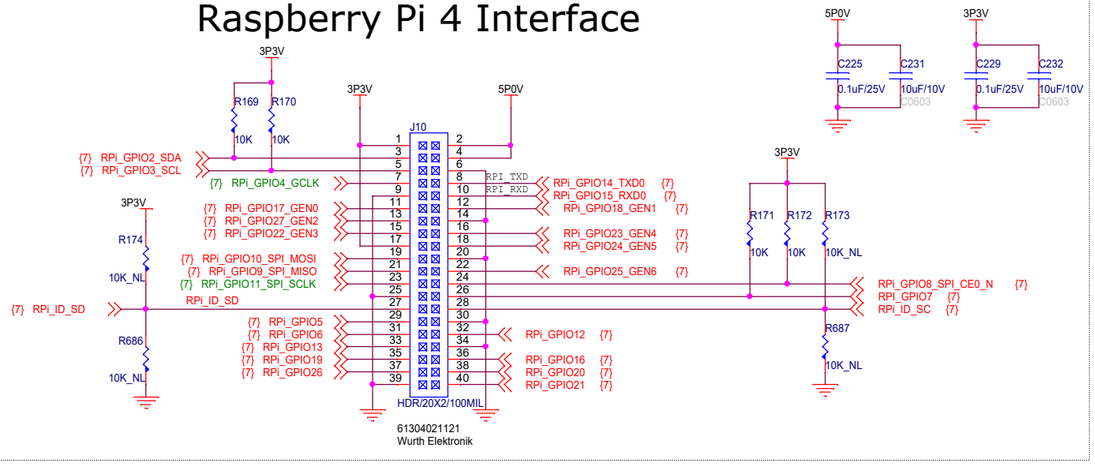
mikroBUS Socket



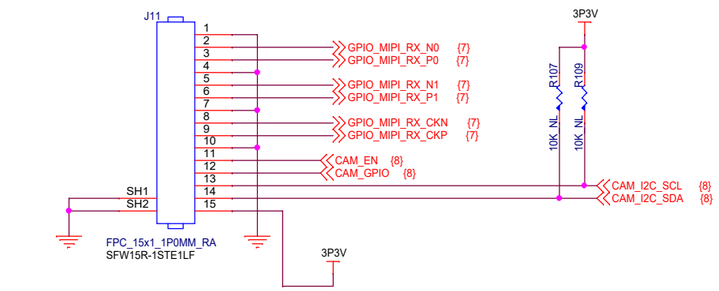
Push Button



Raspberry Pi 4 Interface

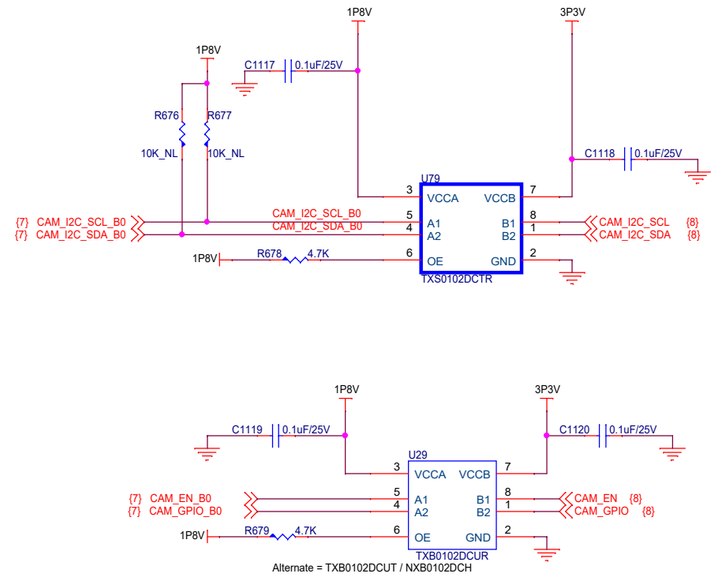


Raspberry Pi MIPI RX Connector

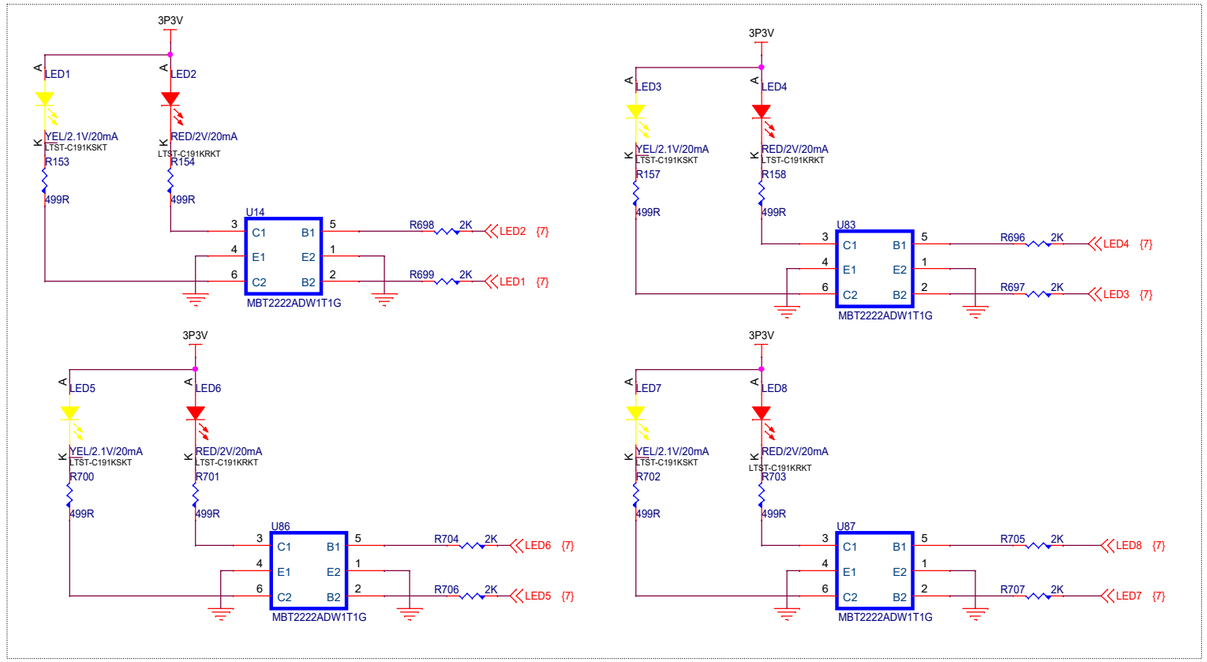


Cable to cable mating, Raspberry Camera module V2 board/Camera HQ

Cable Part Supplied with Camera Module - Opposite Sided Contacts



Alternate = TXB0102DCUT / NXB0102DCH



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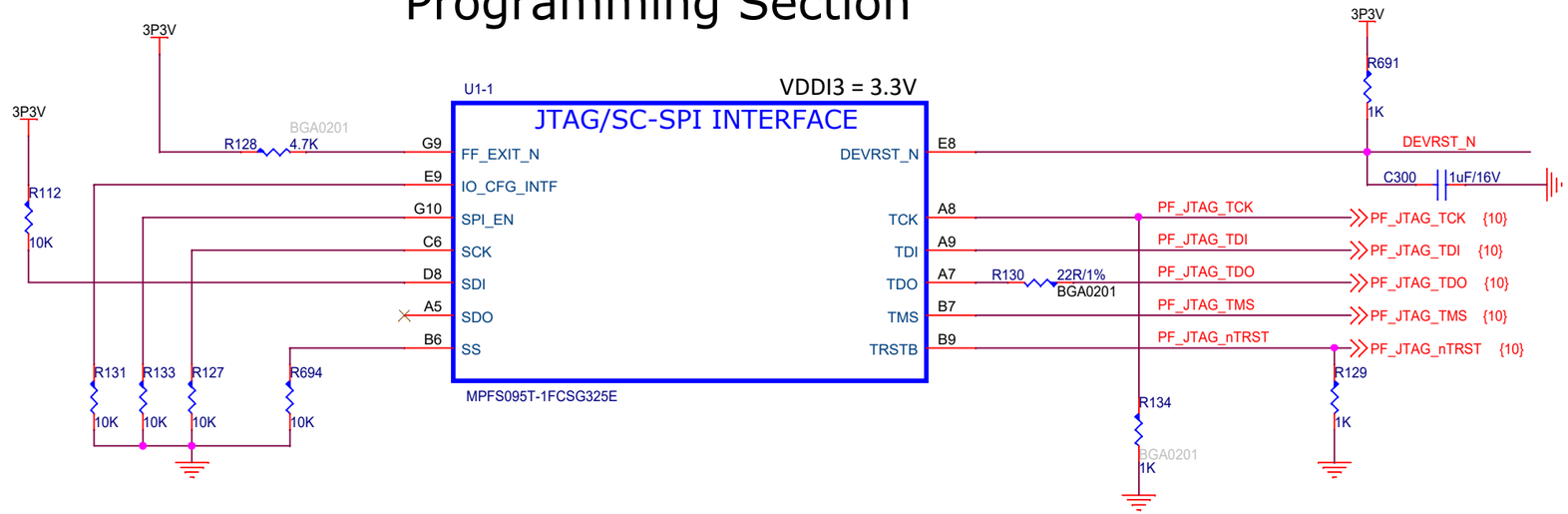
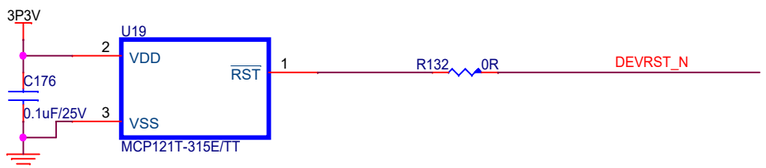
Programming Section



Device Reset



MICROCHIP

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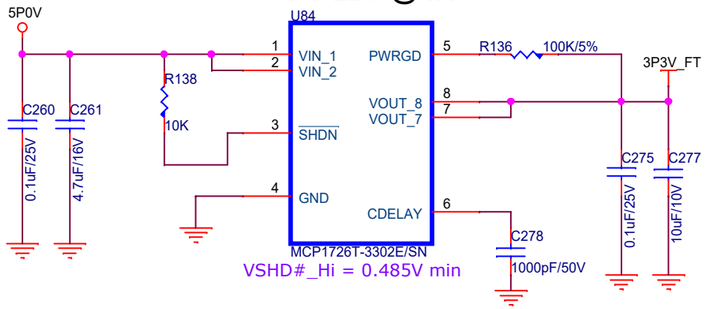
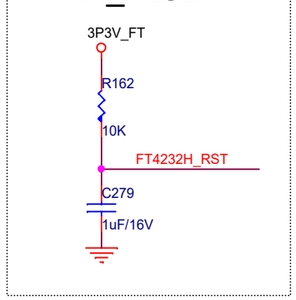
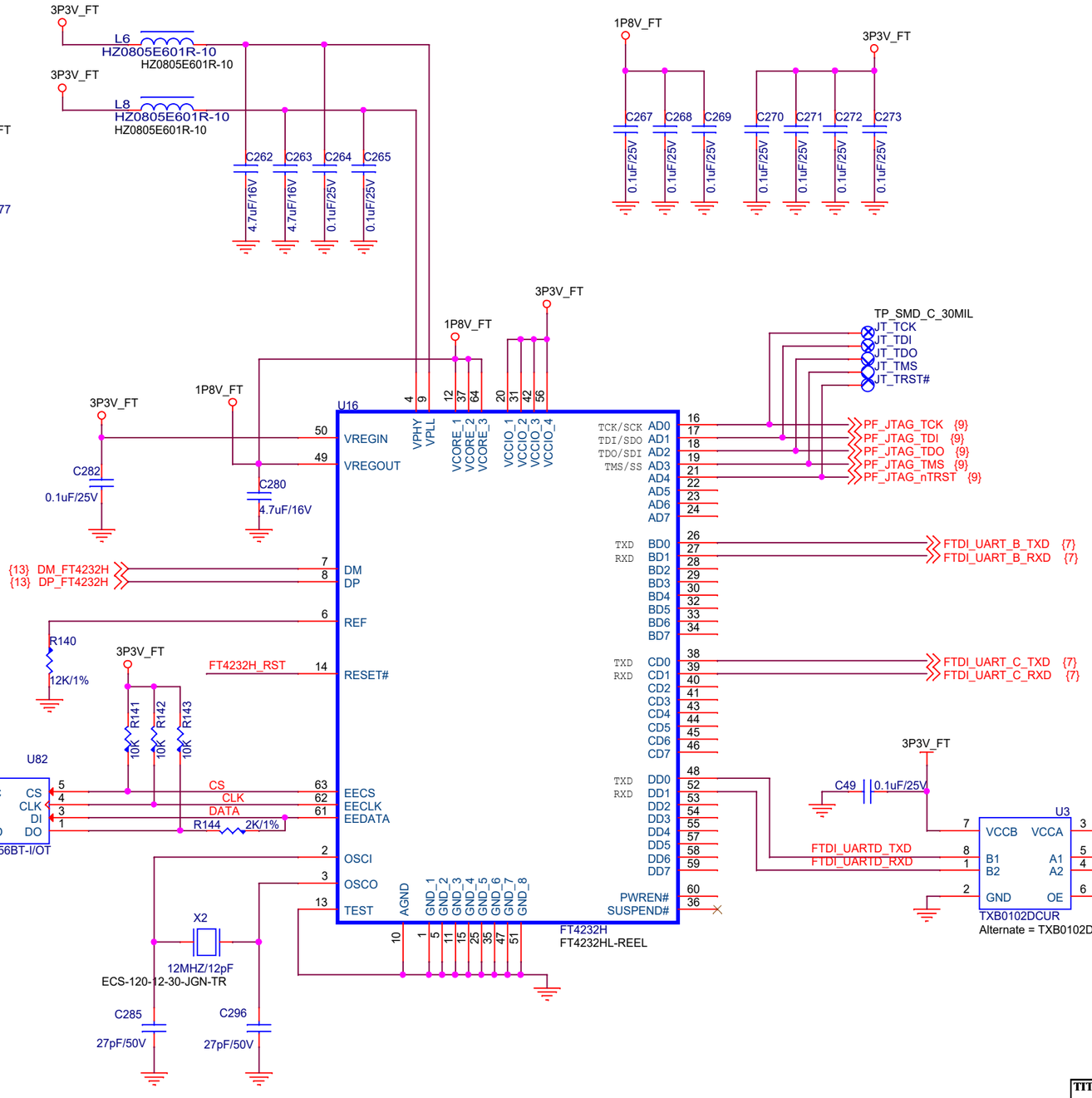
FT4232H Connection

3.3V LDO @ 1A



FTDI_RESET





MICROCHIP

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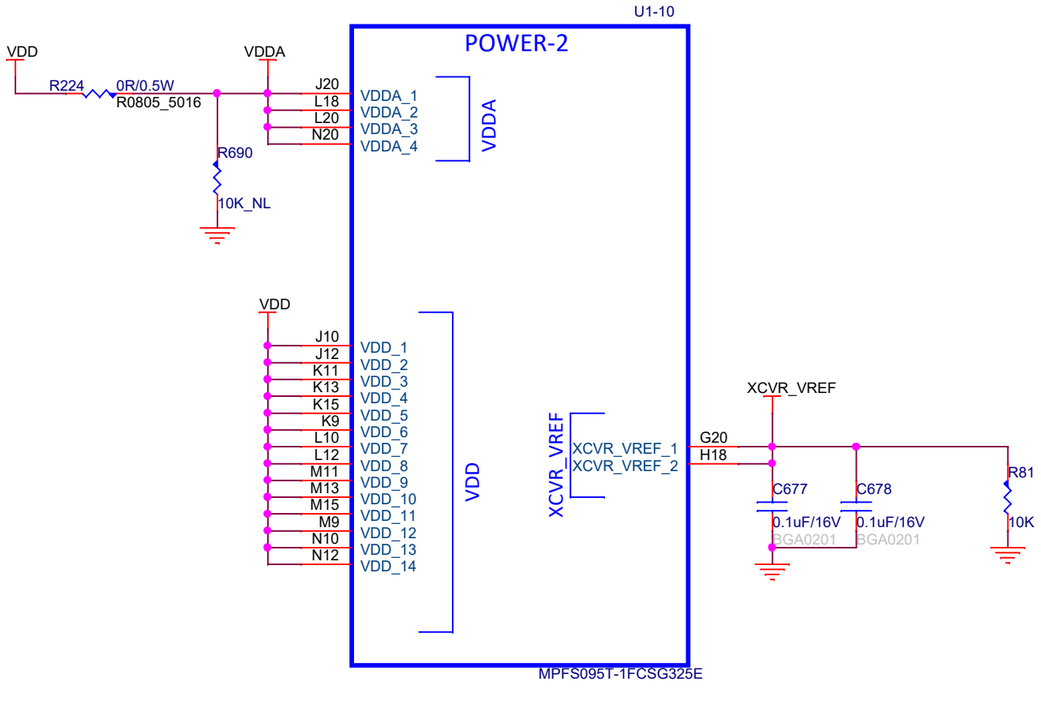
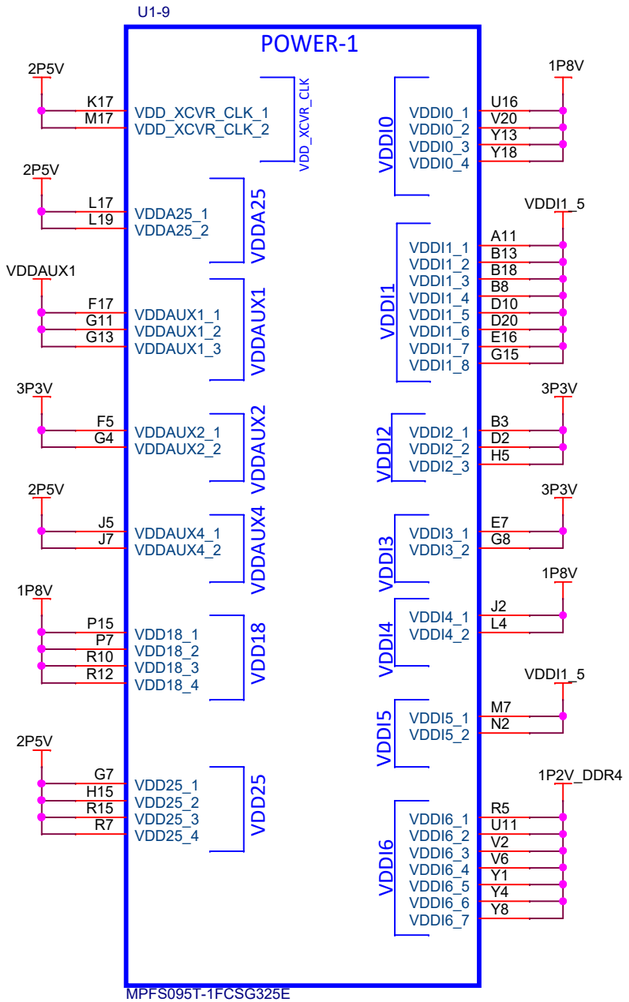
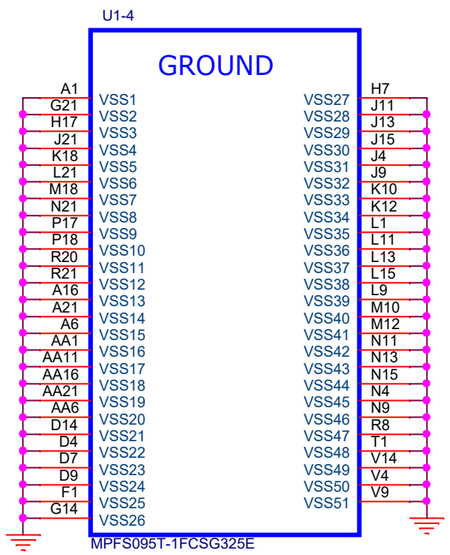
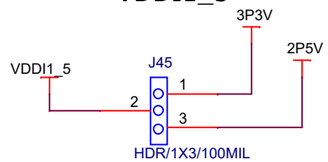
Power & GND Connection







VDDI1_5

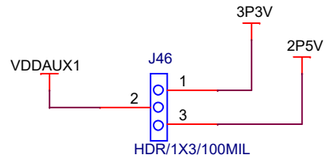


VDDI1_5 and VDDAUX1

2.5V for MIPI and Ethernet PHY operation

3.3V for RPI and MikroBus operation

VDDAUX1



MICROCHIP

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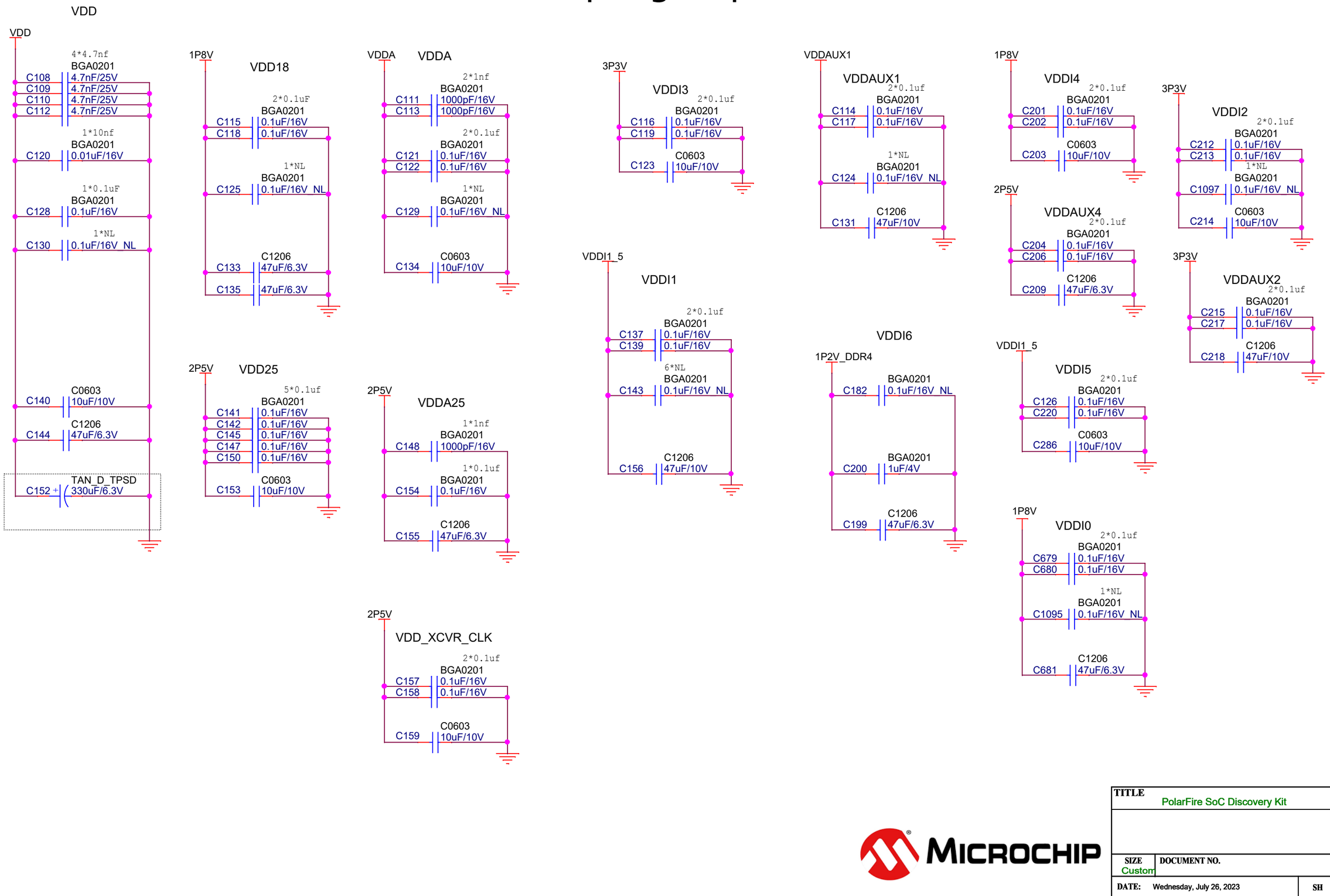
Decoupling Capacitors



MICROCHIP

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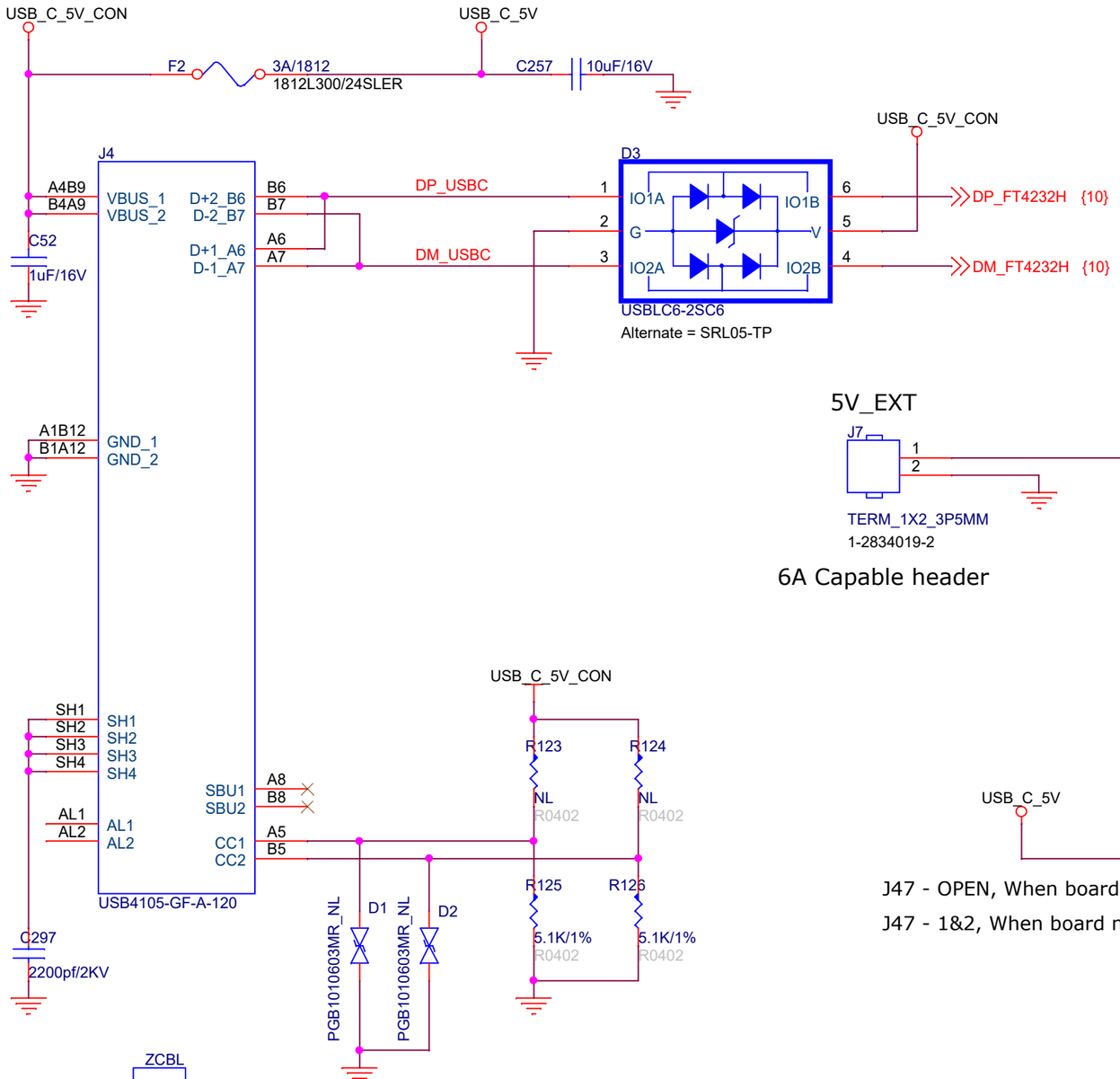
5V DC Supply



J47 - OPEN, When board need to be powered via header J7

J47 - 1&2, When board need to be powered by USB Type C connector J4

MICROCHIP

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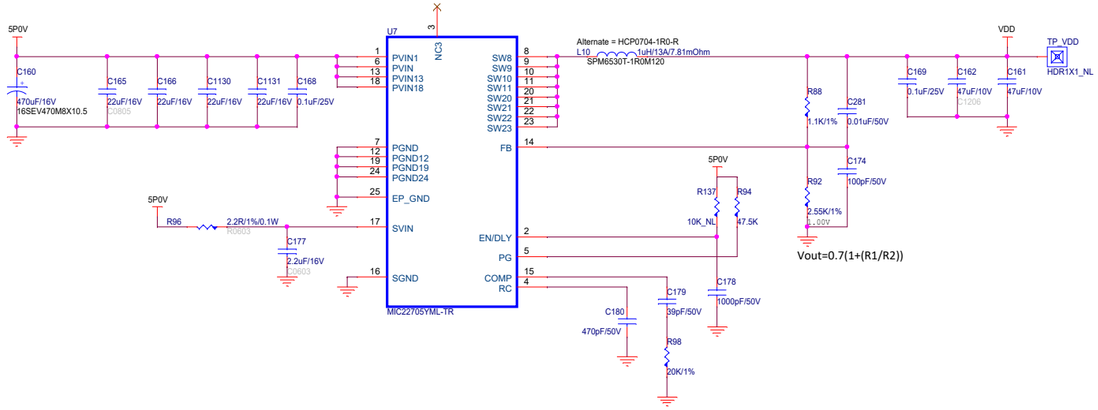
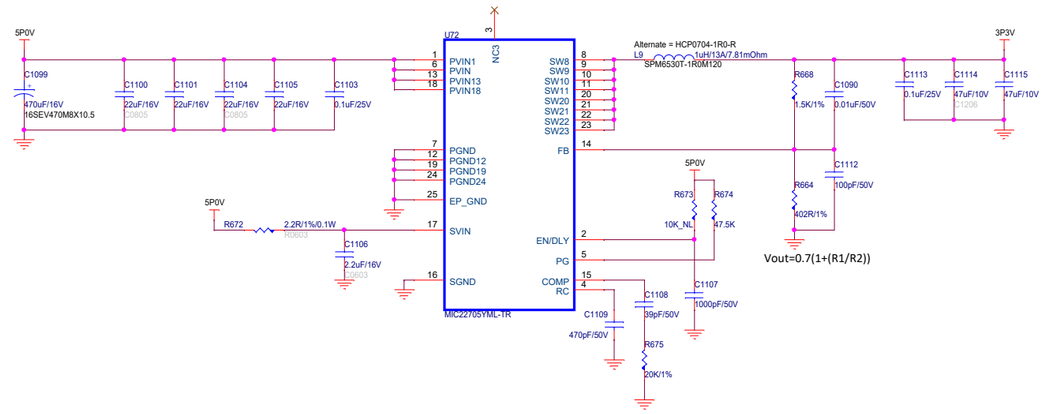
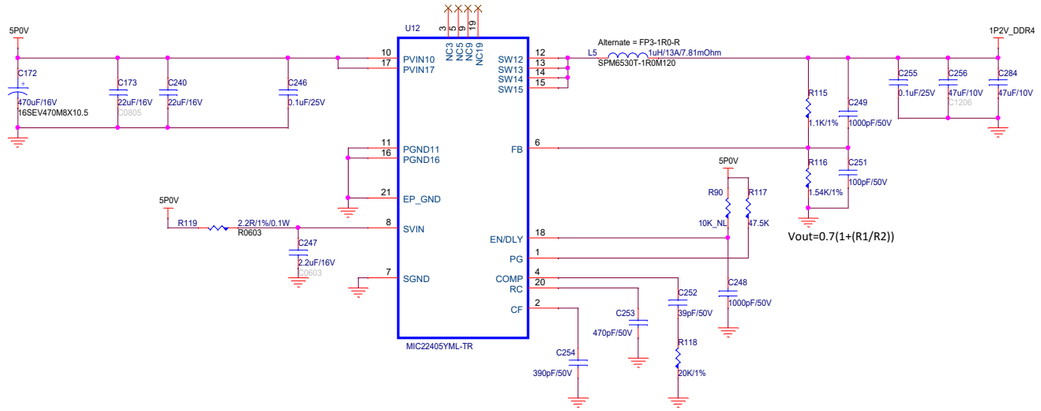
POWER:VDD 1.0V@7A



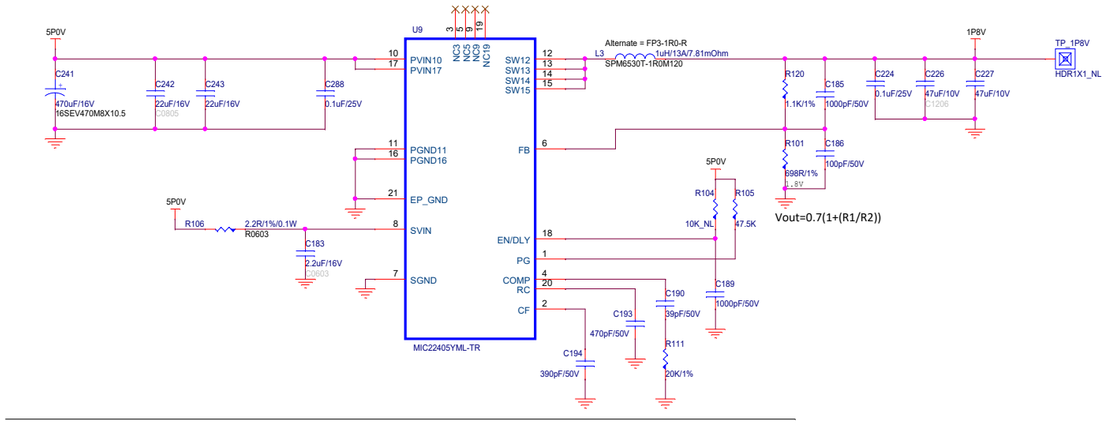
POWER:3P3V@7A



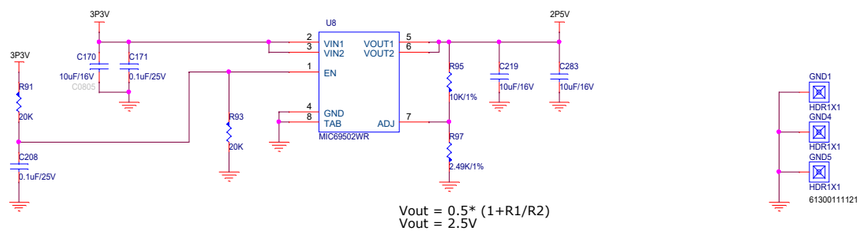
POWER:1.2V for DDR4, VDDI6 @4A



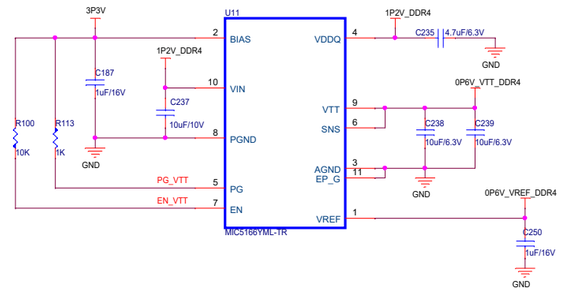
POWER:1.8V@4A

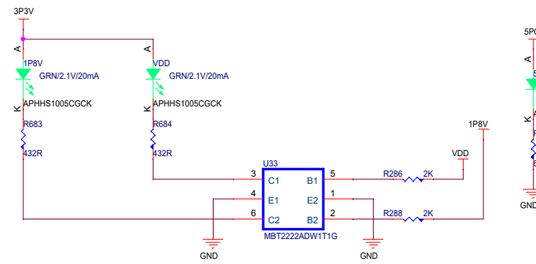


POWER:2.5V for PLL @5A



POWER:DDR4 VTT & VREF





MICROCHIP

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