


REVISION HISTORY

15 April 2020
Initial release V1.0B

WARNING: Newer product versions will introduce several critical changes. Please check the notes in red contained in the schematic pages.

The Verdin Carrier Board design guide contains the latest updated information required to properly design a carrier board compatible with the Verdin family specification: <https://docs.toradex.com/108140-verdin-carrier-board-design-guide.pdf>

Please make sure you carefully check your designs against all the sections of this document, before proceeding with the carrier board manufacturing.



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Title <i>Dahlia Carrier Board</i>			Toradex AG Ebenaustrasse 10 Horw 6048 Switzerland
Size: A3	Number:2.	Revision:V1.0	
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File: Revision_History-1.SchDoc			

X9

PWR_IN

GND_IN

1

3

2

+V_PWR_IN_1

GND_IN_1

RAPC722X

5V -27V

The schematic diagram illustrates the internal circuitry of the LTC4368IDD-2#PBF, a precision current limit and shutdown controller. Key components and their connections include:

- Power Input and Filtering:** The circuit is powered by a 28.7V supply (OV - 28.7V, UV - 4.3V) with an inrush current limit of 1.5A. The input is filtered by a 36R resistor (L20) and a 100MHz capacitor (C105).
- Current Sensing and Limiting:** The current sense resistor (R134, 1K) is connected to the +V_SUPPLY_FILTER. The sense voltage is amplified by the LTC4368 (IC18) and compared to a reference (R135, 0.01R) to trigger the current limit.
- Shutdown and Fault Protection:** The LTC4368 (IC18) provides a shutdown signal (SHDN) to the MOSFETs (T17, T18) and a fault signal (FAULT) to the LED8 (RED).
- Output and Protection:** The output is connected to a 16V capacitor (C108) and a 100nF capacitor (C108) for protection.

Diagram illustrating the power supply filter circuit for the X6 module. The circuit shows three parallel filter capacitors (C225, C226, C227) connected between the +V_SUPPLY_FILT_SW, +V5_SW, and +V1.8_SW lines and GND. A red 'X' is placed over the X6 module, indicating that the filter capacitors are not required for this module.

I2C Slave Address Table

A1	A0	Slave address	
GND	GND	1000000	R/W
GND	VSS	1000001	R/W
VSS	GND	1000100	R/W
VSS	VSS	1000101	R/W

Component List:

- IC19: FXMA2102L8X
- IC21: INA219
- C107: 100nF 16V
- C106: 100nF 16V
- C109: 100nF 16V
- C116: 100nF 16V
- C118: 22uF 10V
- C119: 4.7uF 10V
- C120: 4.7uF 10V
- C121: 4.7uF 10V
- C122: 4.7uF 10V
- C123: 4.7uF 10V
- R145: 0R
- R146: 0R
- R141: 10K
- R142: 10K
- R157: 10R
- R158: 10R
- R159: 0R
- R160: 0R
- R167: 0.01R
- R179: 1K

Back-up Battery Circuit:

The back-up battery circuit consists of a BAT1 (Keystone-3000) connected to the +V BATT pin. The battery is connected to the VCC BACKUP pin via a 1K resistor (R179). The battery is also connected to the GND pin.

Pin Connections:

- IC19: VCCA to VCC, VCCB to VCC, GND to GND, A0 to I2C_1_SCL, A1 to I2C_1_SDA, OE to +V1.8_SW.
- IC21: VIN+ to VCC, VIN- to VCC, GND to GND, SDA to I2C_1_SCL, SCL to I2C_1_SDA, A0 to I2C_1_SCL, A1 to I2C_1_SDA.

Power Supply Connections:

- +V1.8_SW: Connected to VCC.
- +V3.3_SW: Connected to VCC.
- +V3.3: Connected to VCC.

Capacitor Connections:

- C107: Connected between +V1.8_SW and GND.
- C106: Connected between +V3.3_SW and GND.
- C109: Connected between VIN+ and GND.
- C116: Connected between +V3.3_SW and GND.
- C118, C119, C120, C121, C122, C123: Connected between VCC and GND.

Resistor Connections:

- R145, R146: Connected between I2C_1_SCL and I2C_1_SDA.
- R141, R142: Connected between +V3.3_SW and GND.
- R157, R158: Connected between VIN+ and VIN-.
- R159, R160: Connected between SDA and SCL.
- R167: Connected between +V3.3 and VCC.
- R179: Connected between +V BATT and VCC BACKUP.

Pin Header Connections:

- Pin 1: GND
- Pin 2: GND
- Pin 3: GND
- Pin 4: GND
- Pin 5: GND
- Pin 6: GND
- Pin 7: GND
- Pin 8: GND
- Pin 9: GND
- Pin 10: GND
- Pin 11: GND
- Pin 12: GND
- Pin 13: GND
- Pin 14: GND
- Pin 15: GND
- Pin 16: GND
- Pin 17: GND
- Pin 18: GND
- Pin 19: GND
- Pin 20: GND
- Pin 21: GND
- Pin 22: GND
- Pin 23: GND
- Pin 24: GND
- Pin 25: GND
- Pin 26: GND
- Pin 27: GND
- Pin 28: GND
- Pin 29: GND
- Pin 30: GND
- Pin 31: GND
- Pin 32: GND
- Pin 33: GND
- Pin 34: GND
- Pin 35: GND
- Pin 36: GND
- Pin 37: GND
- Pin 38: GND
- Pin 39: GND
- Pin 40: GND
- Pin 41: GND
- Pin 42: GND
- Pin 43: GND
- Pin 44: GND
- Pin 45: GND
- Pin 46: GND
- Pin 47: GND
- Pin 48: GND
- Pin 49: GND
- Pin 50: GND
- Pin 51: GND
- Pin 52: GND
- Pin 53: GND
- Pin 54: GND
- Pin 55: GND
- Pin 56: GND
- Pin 57: GND
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- Pin 84: GND
- Pin 85: GND
- Pin 86: GND
- Pin 87: GND
- Pin 88: GND
- Pin 89: GND
- Pin 90: GND
- Pin 91: GND
- Pin 92: GND
- Pin 93: GND
- Pin 94: GND
- Pin 95: GND
- Pin 96: GND
- Pin 97: GND
- Pin 98: GND
- Pin 99: GND
- Pin 100: GND

USB-C STANDBY VOLTAGE LDO

The inset shows the USB-C STANDBY VOLTAGE LDO circuit, which is a voltage regulator used to provide a standby voltage to the USB-C port. The circuit includes the following components:

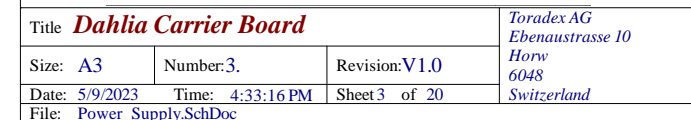
- IC24:** NCV4274CST50T3G
- Vin:** +V_BUS_PD
- Vout:** +V5_PD
- C131:** 100nF 50V
- C132:** 10uF 10V

The circuit is connected to the USB-C port controller (IC22) and the USB-C port driver (IC23).

The schematic diagram illustrates the VCC_BACKUP circuit. A battery (BAT1, Keystone-3000) is connected to a 1K resistor (R179). The other end of the resistor is connected to the VCC_BACKUP pin (249) of the 2309409-2 component. The VCC_BACKUP pin is also connected to a GND pin (243) of the same component.

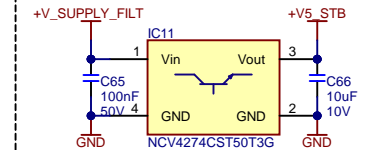
The image displays three circuit diagrams for driving LEDs, each enclosed in a dashed rectangular box.

- Top Diagram (Resistor-Limited LED):** A simple circuit where an LED (LED15 GREEN) is connected in series with a resistor (R186, 2.2K) to a +V5_SW supply. The other end of the LED is connected to GND.
- Middle Diagram (BJT Driver):** A common-emitter BJT driver circuit. The base of the transistor (T29B, NTZD3154NT1G) is connected to a +V3.3 supply through a resistor (R185, 1K). The emitter is connected to GND. The collector is connected to an LED (LED14 GREEN) and a +V1.8_SW supply. The LED's other end is connected to GND.
- Bottom Diagram (MOSFET Driver):** A common-emitter MOSFET driver circuit. The gate of the MOSFET (T29A, NTZD3154NT1G) is connected to a +V3.3_SW supply through a resistor (R191, 1K). The source is connected to GND. The drain is connected to an LED (LED16 GREEN) and a +V3.3_SW supply. The LED's other end is connected to GND.

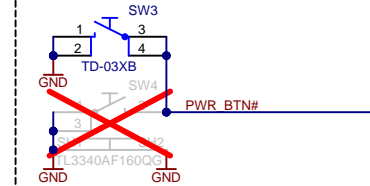


PUSH BUTTON CONTROLLER

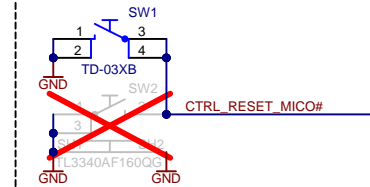
STANDBY VOLTAGE LDO



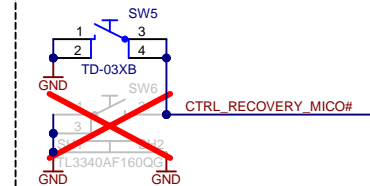
POWER ON/OFF BUTTON



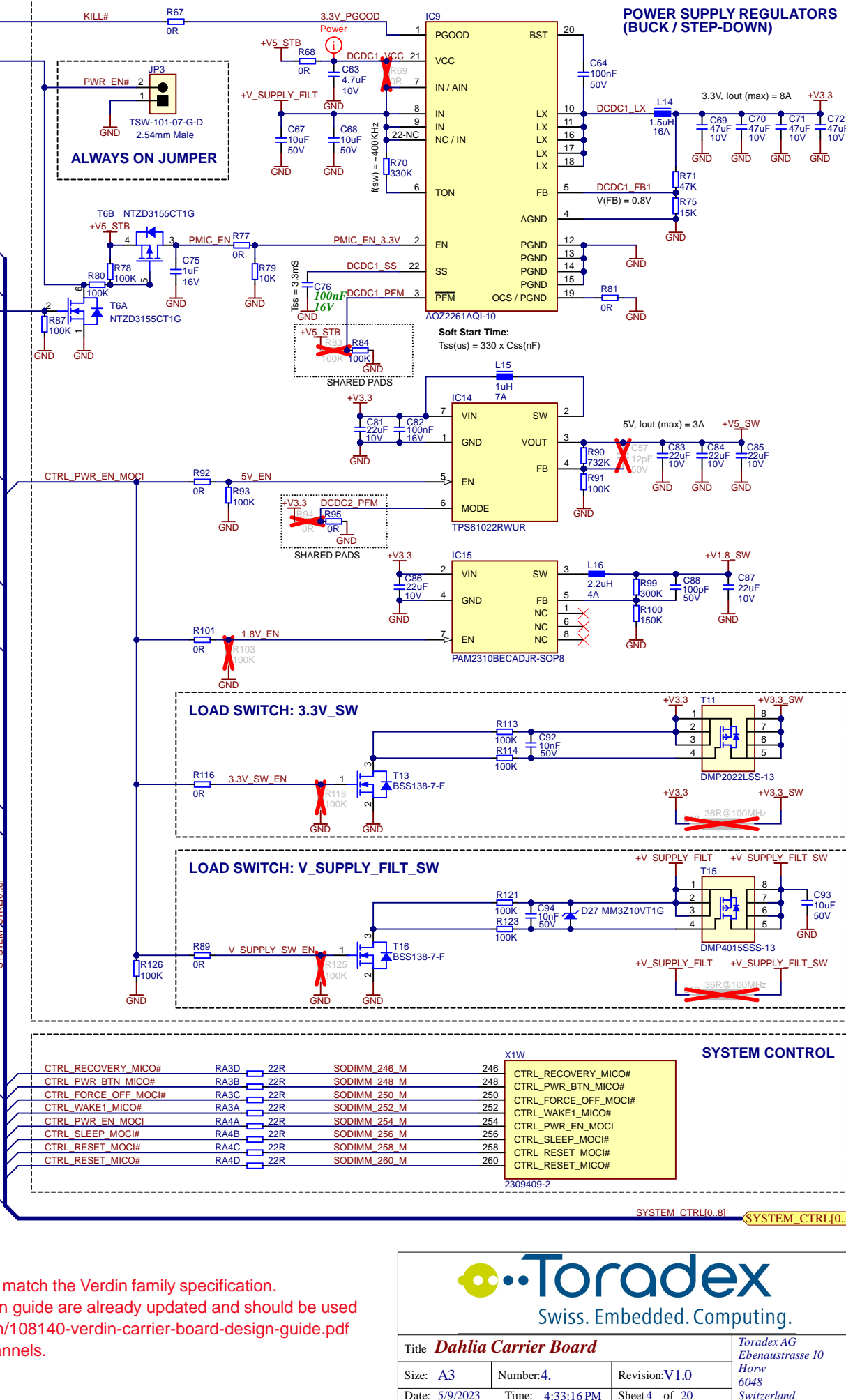
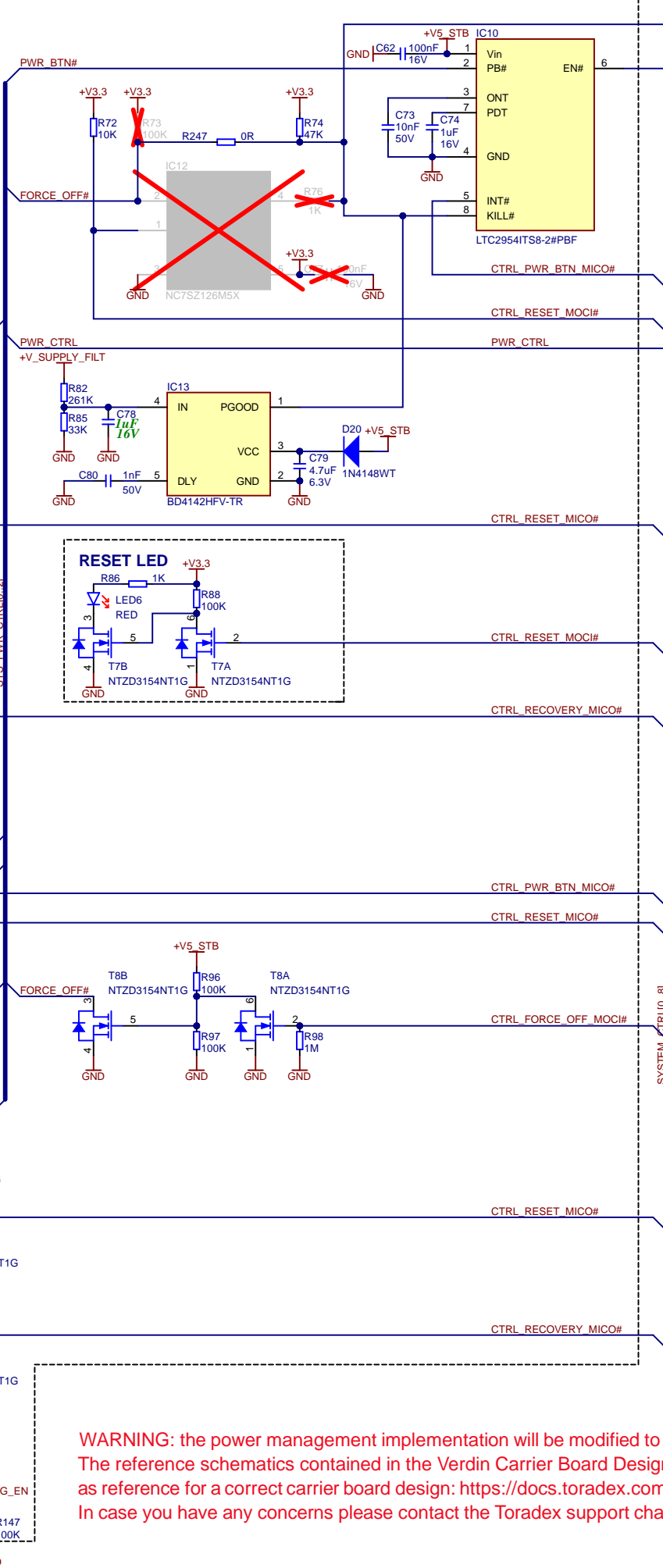
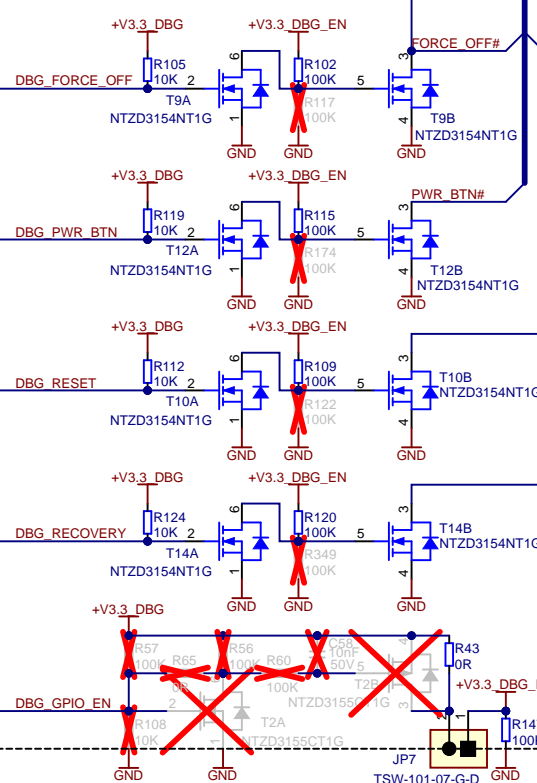
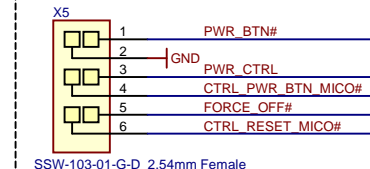
RESET BUTTON



RECOVERY BUTTON



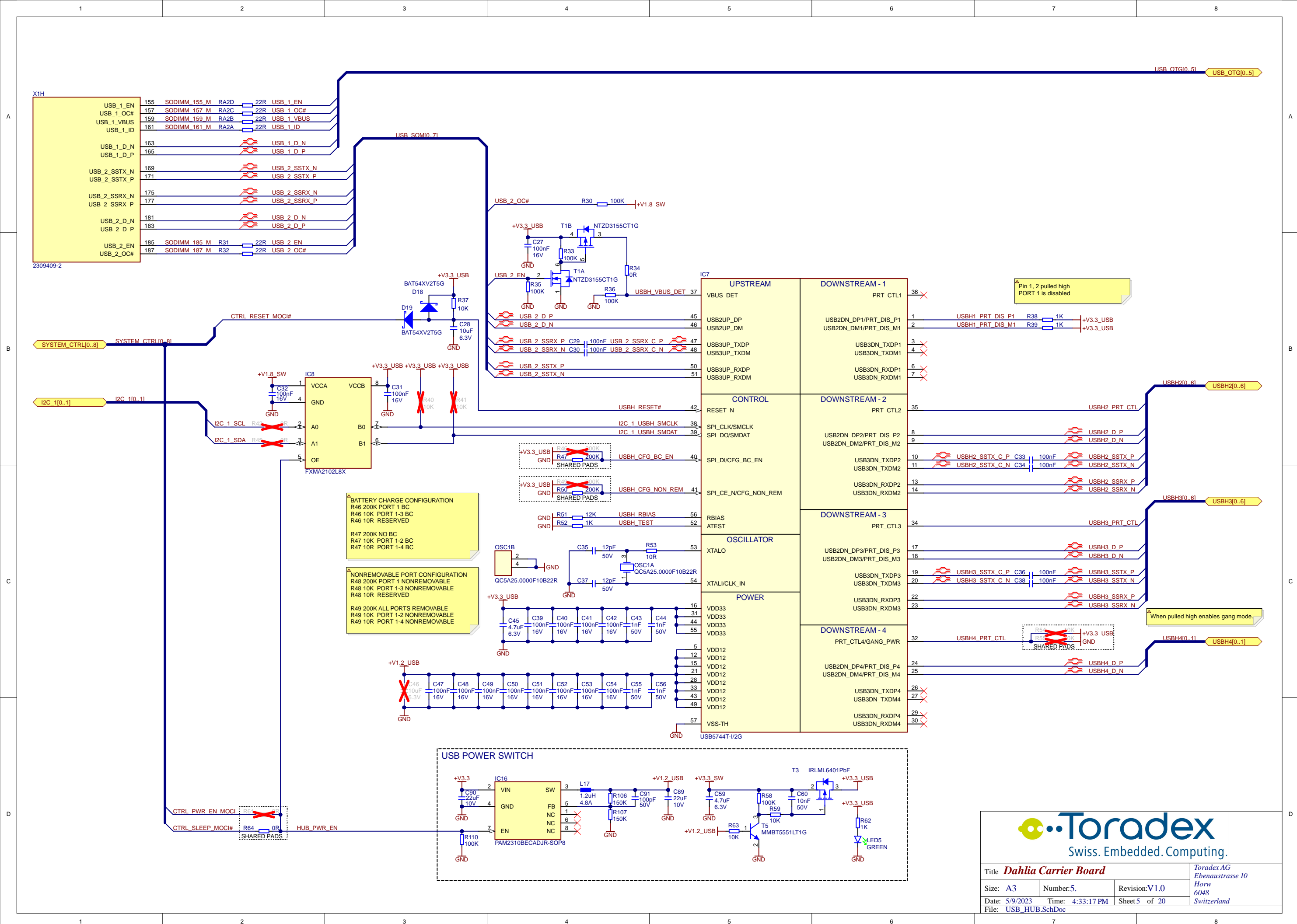
POWER CONTROL CONNECTOR



WARNING: the power management implementation will be modified to match the Verdin family specification. The reference schematics contained in the Verdin Carrier Board Design guide are already updated and should be used as reference for a correct carrier board design: <https://docs.toradex.com/108140-verdin-carrier-board-design-guide.pdf> In case you have any concerns please contact the Toradex support channels.



Title <i>Dahlia Carrier Board</i>			Toradex AG Ebenaustasse 10 Horw 6048 Switzerland
Size: A3	Number: 4	Revision: V1.0	
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File: Power_Switch.SchDoc			



A

B

C

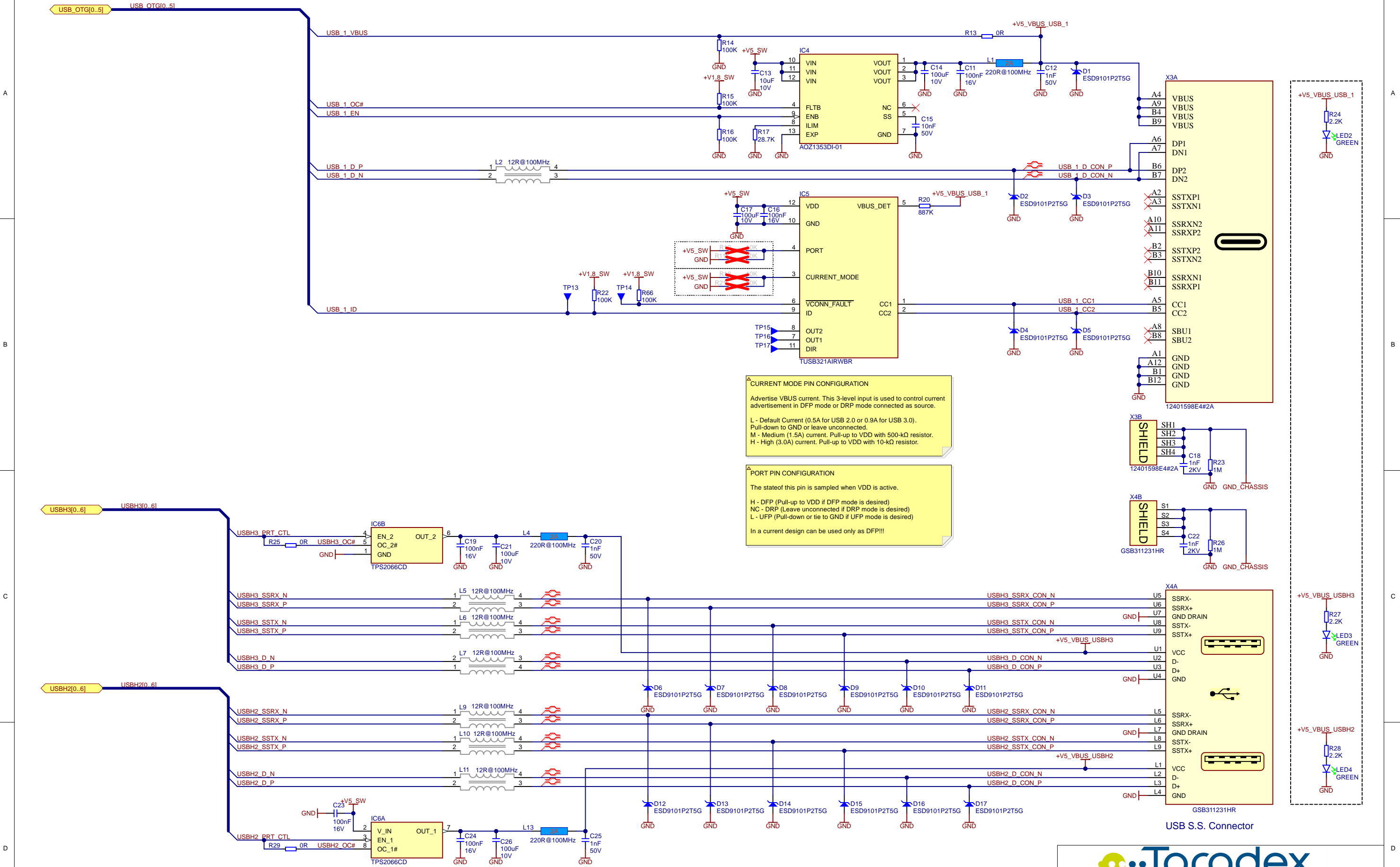
D


A

B

C

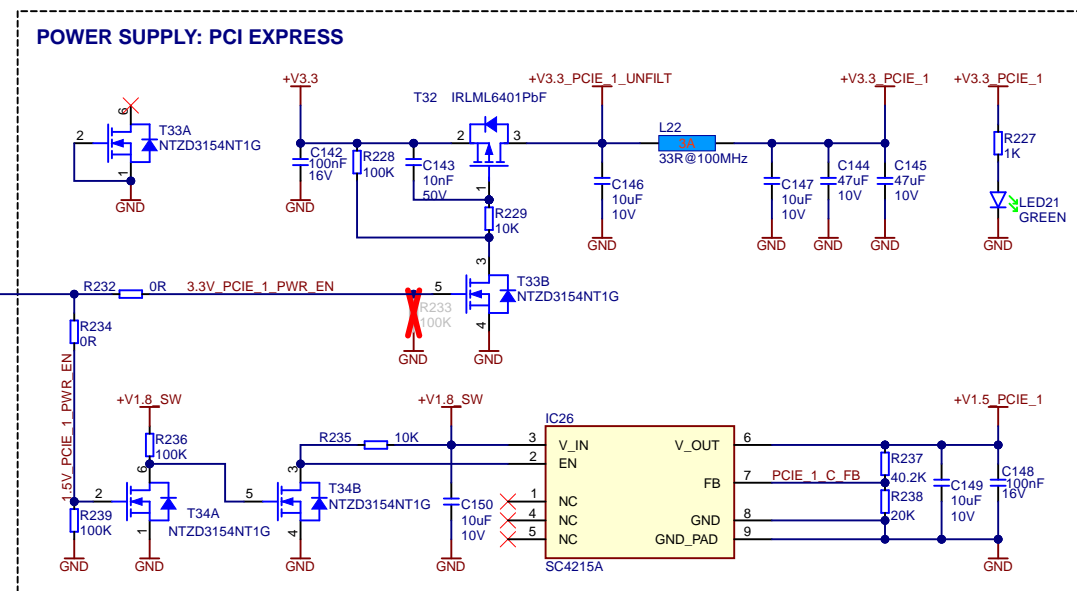
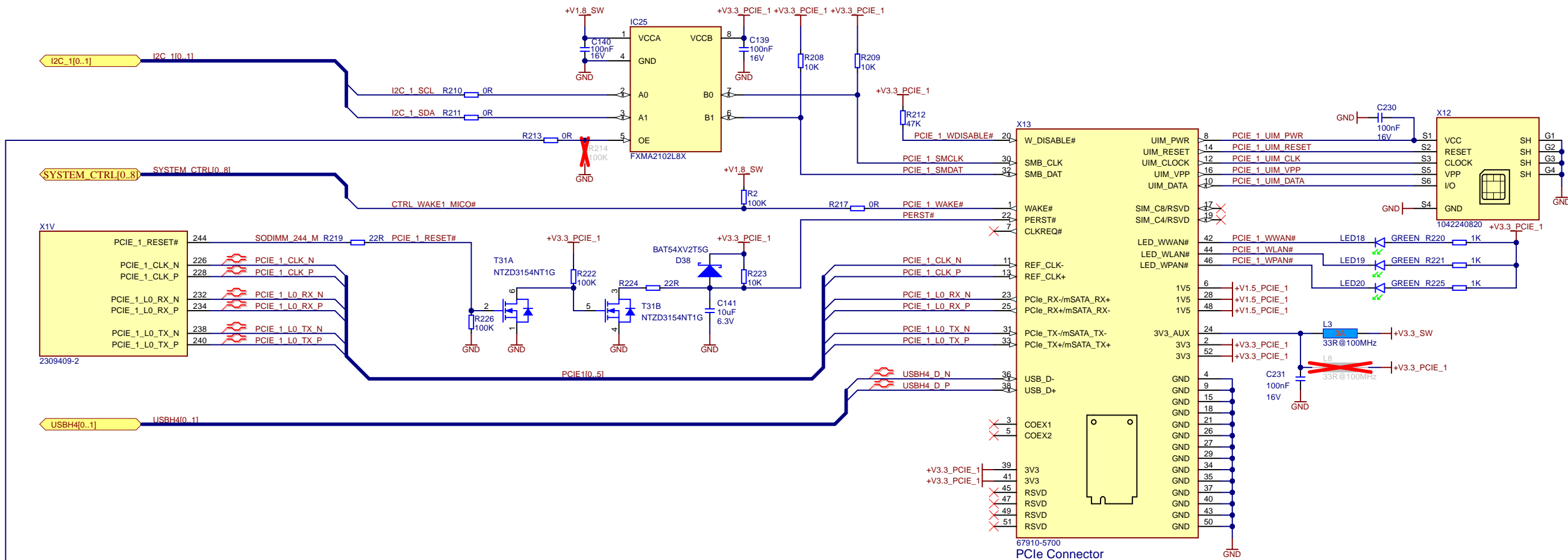
D

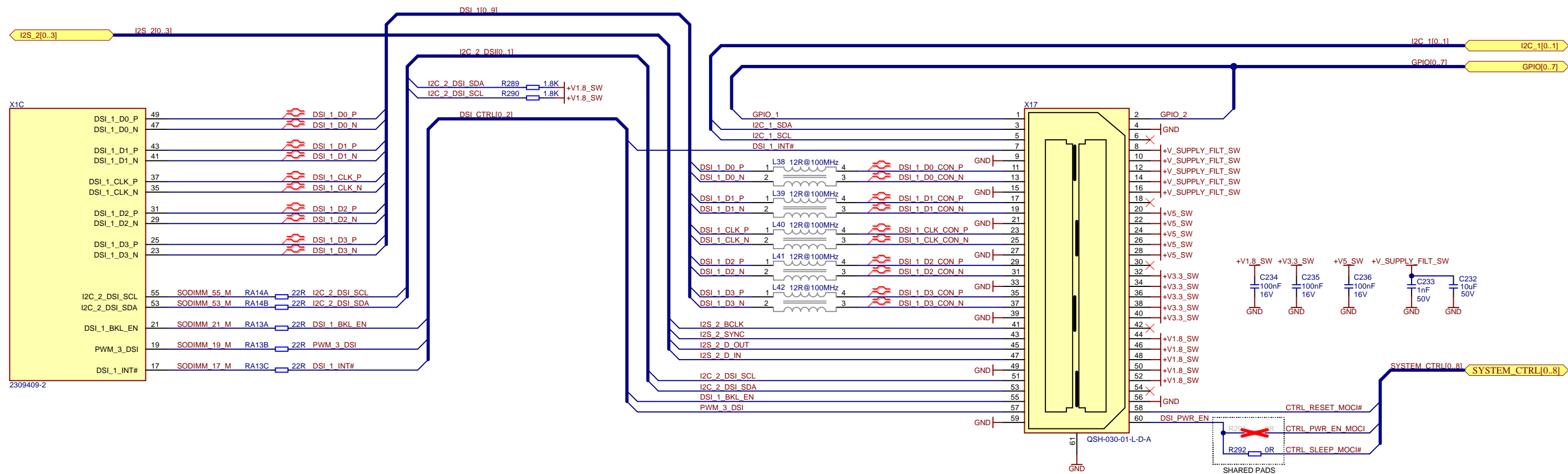




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Title Dahlia Carrier Board			Toradex AG Ebenaustrasse 10 Horw 6048 Switzerland
Size: A3	Number: 6.	Revision: V1.0	
Date: 5/9/2023	Time: 4:33:17 PM	Sheet 6 of 20	
File: USB_Connectors.SchDoc			

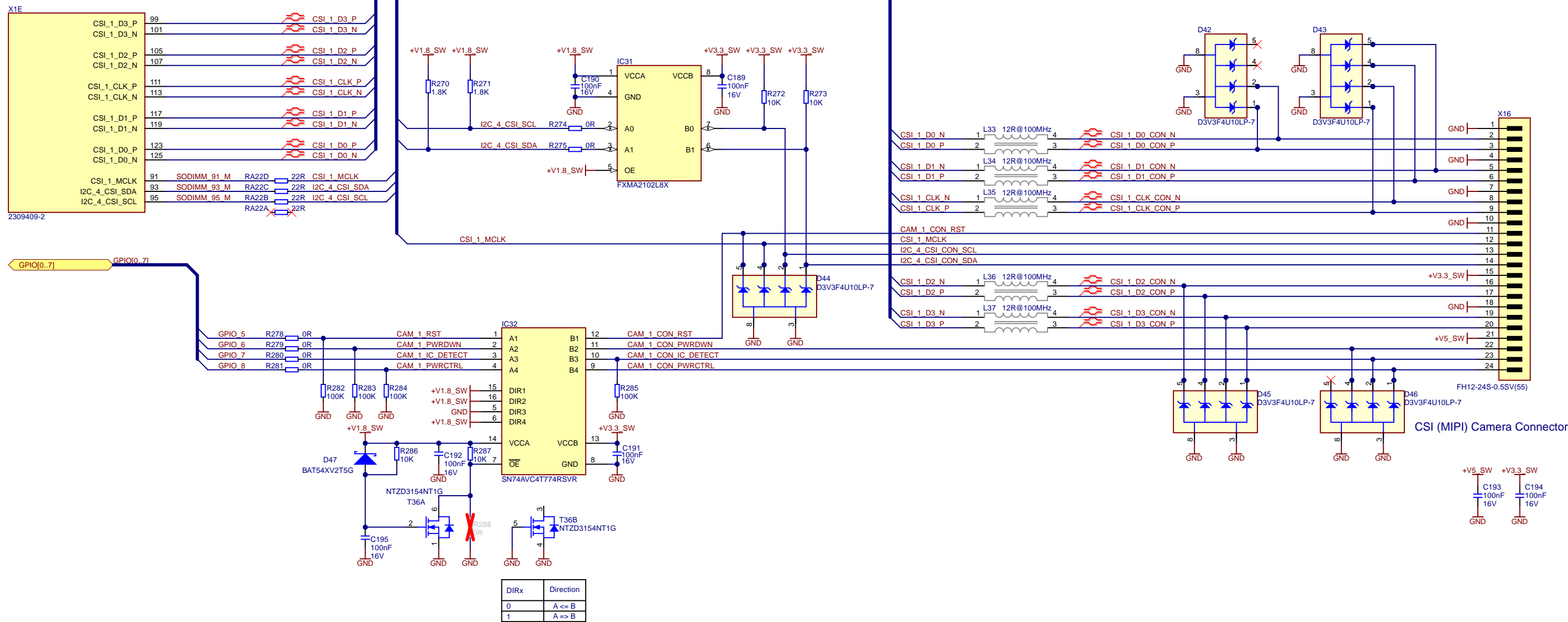


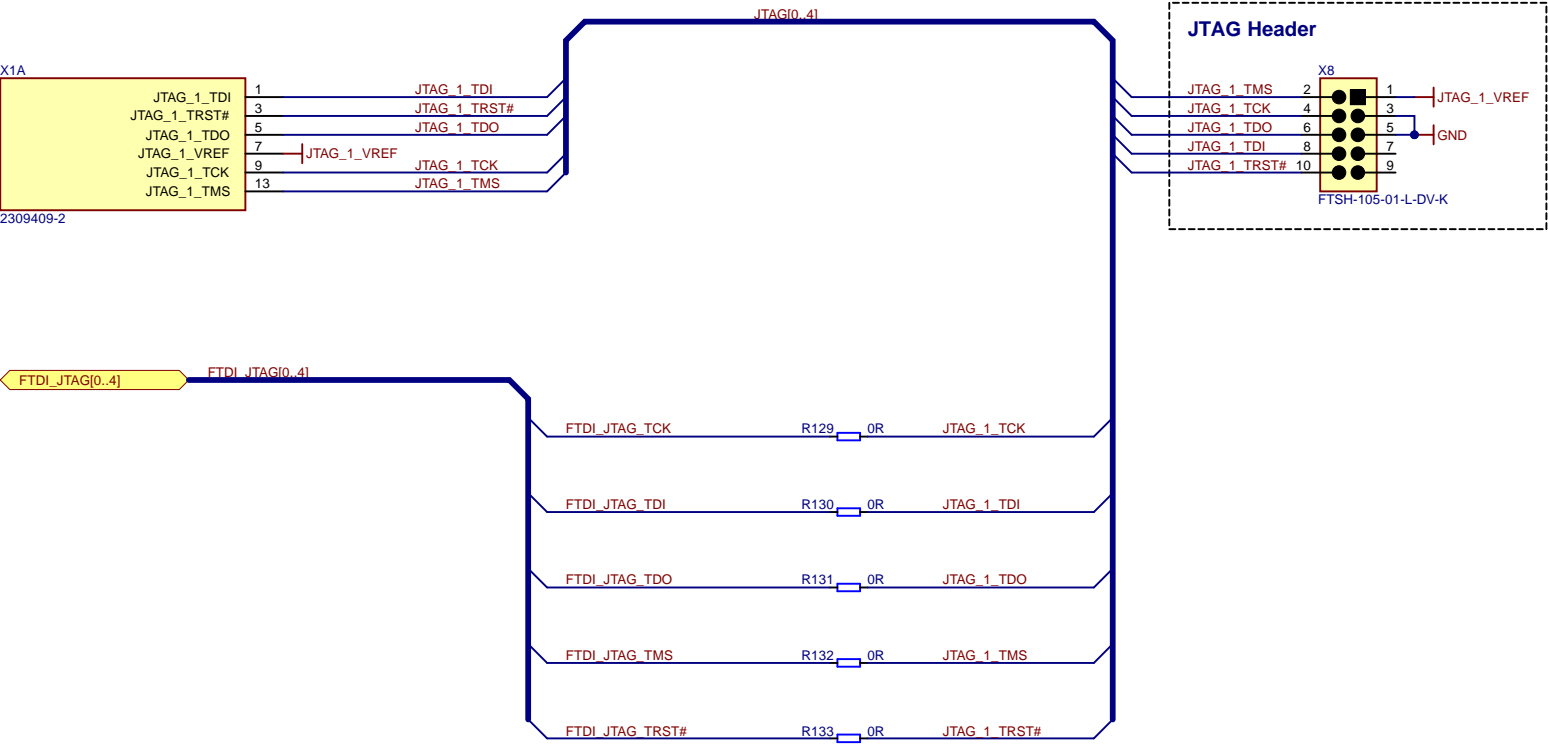


WARNING: Newer product versions are using a different MIPI DSI Connector X17 (Samtech LSS-130-03-L-DV-A-K-TR) and a different pinout and GPIOs assignment. More details on this topic are in section 2.6 of the Verdin carrier Board Design Guide: <https://docs.toradex.com/108140-verdin-carrier-board-design-guide.pdf>. If you are planning to implement this feature in your custom carrier board, please contact the Toradex support channels.

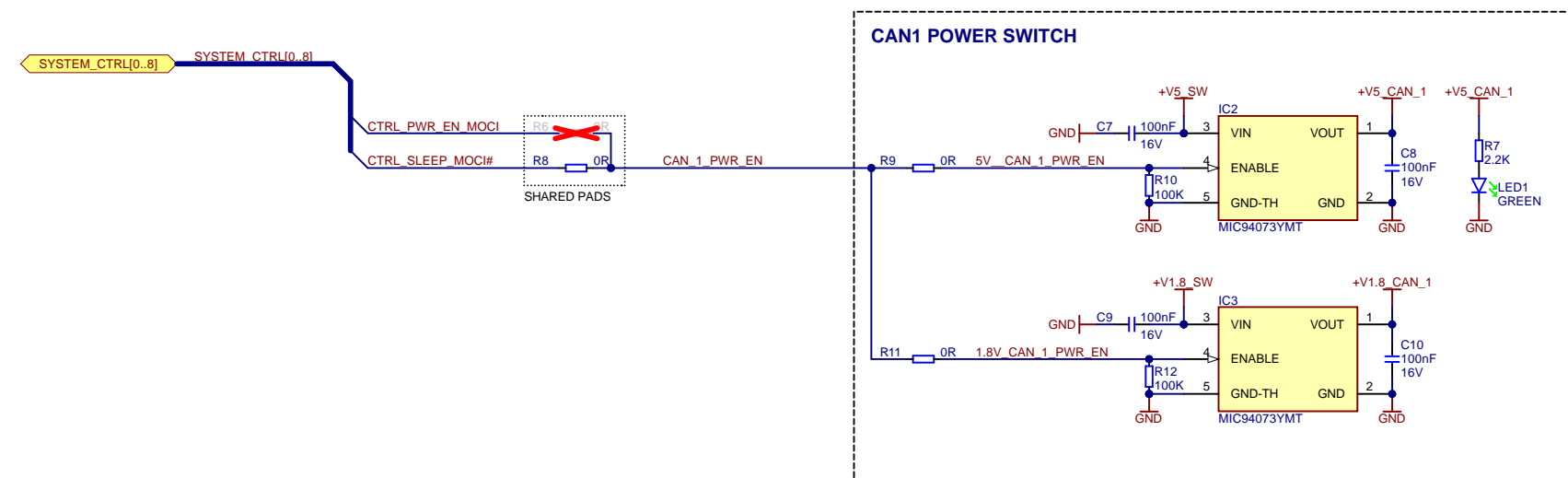
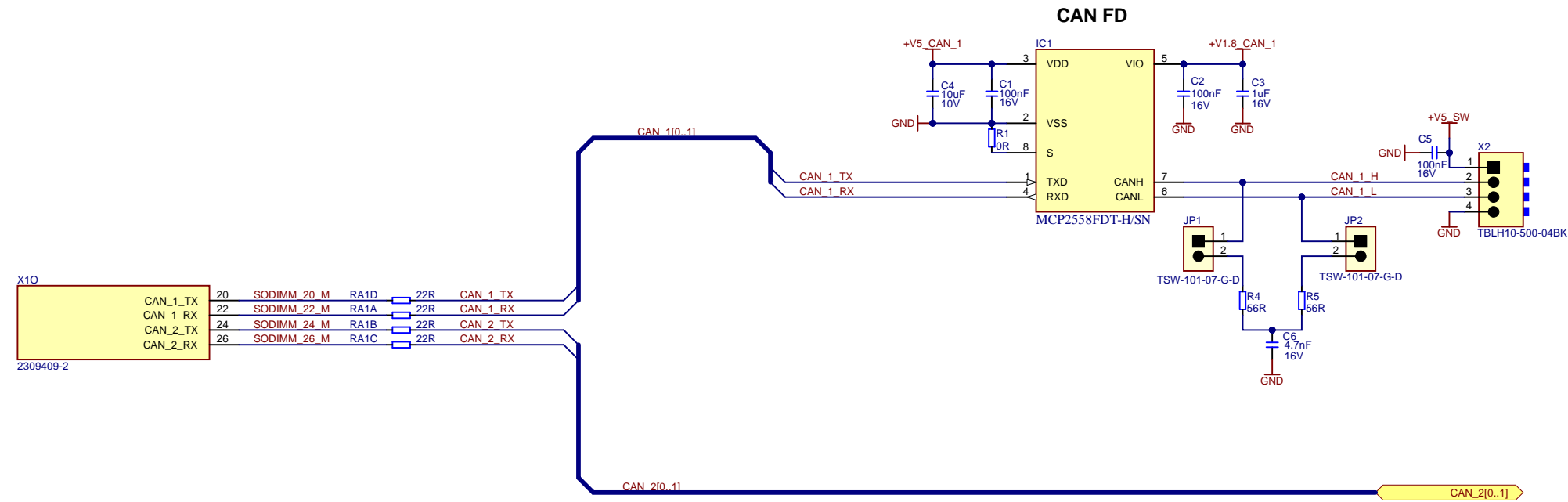


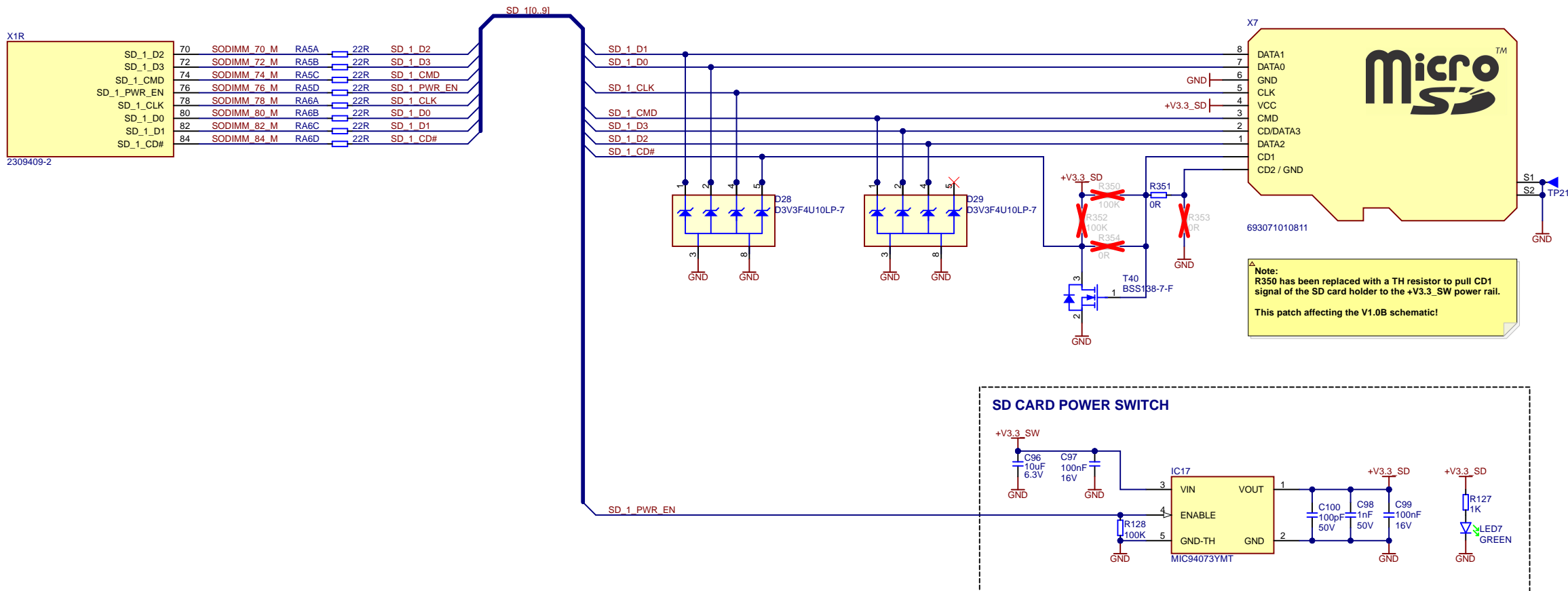
Title <i>Dahlia Carrier Board</i>			<i>Toradex AG</i> <i>Ebenaustrasse 10</i>	
Size: A3	Number: 9	Revision: V1.0	<i>Horw</i> <i>6048</i>	
Date: 5/9/2023	Time: 4:33:17 PM	Sheet 9 of 20	<i>Switzerland</i>	
File: MIPI-DSI.SchDoc				

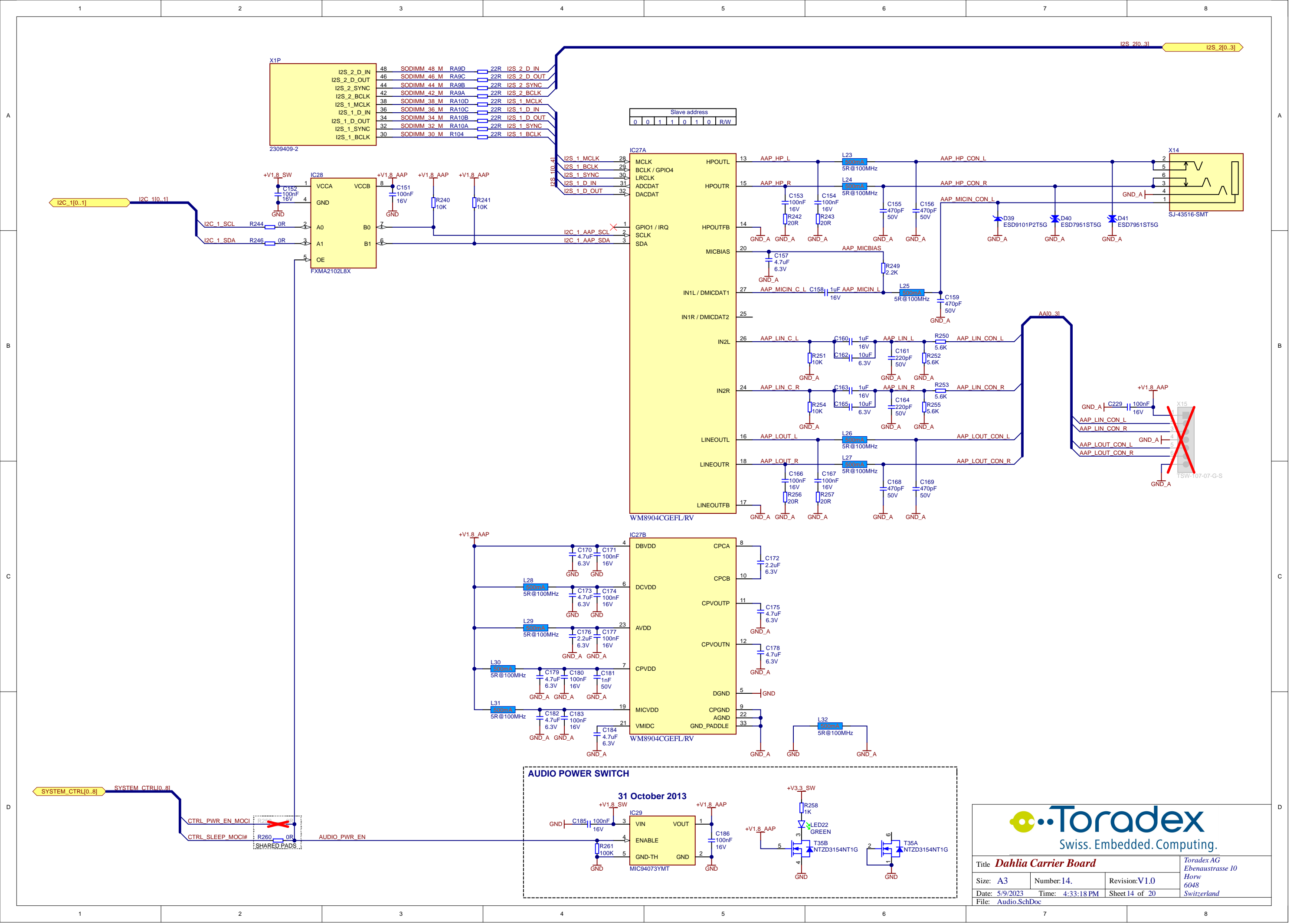


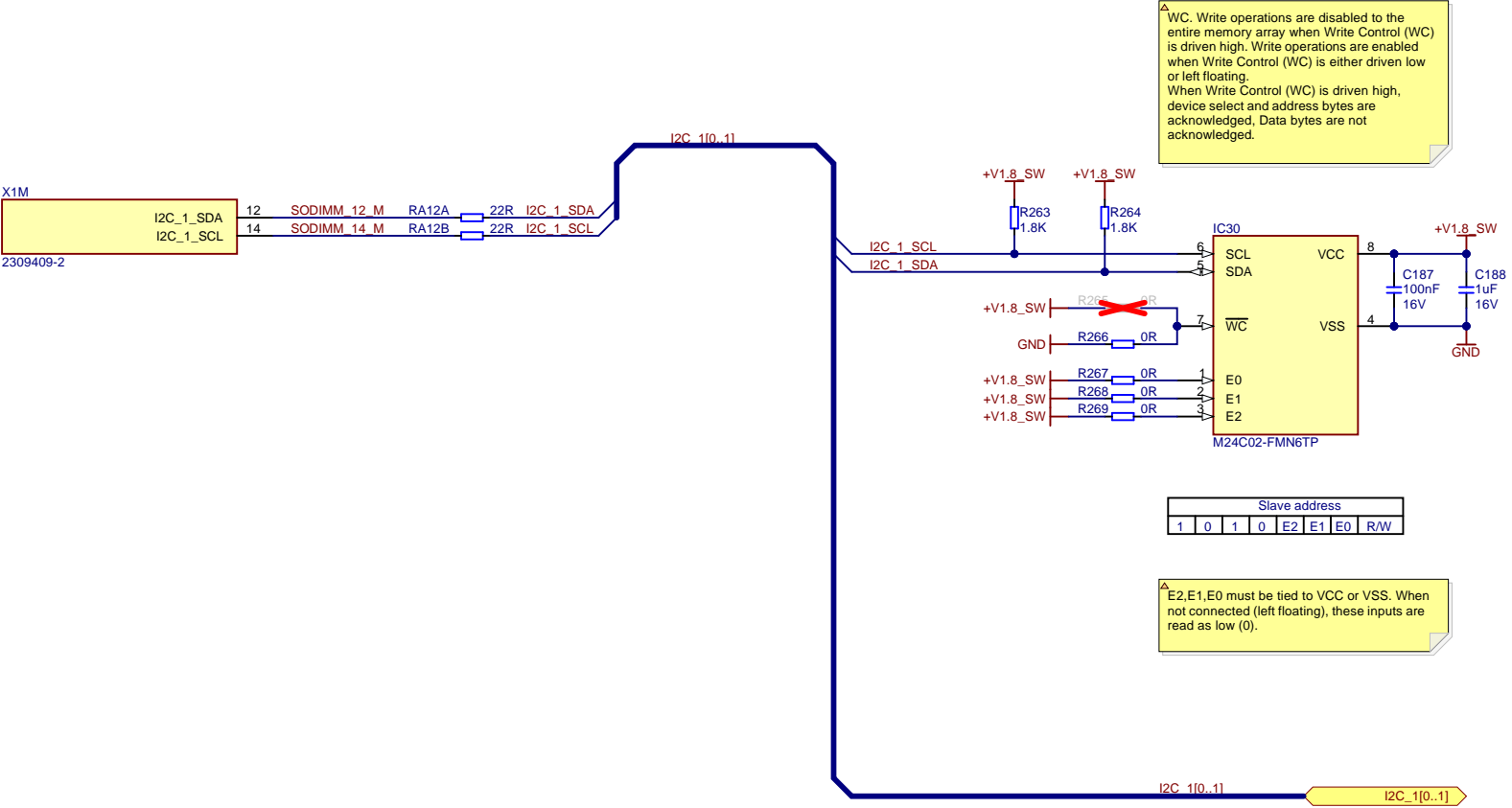


WARNING: Please be aware that this CAN interface is not providing any isolation. This might cause damages if the carrier board is used in a harsh environment with uncontrolled voltage on the CAN bus.





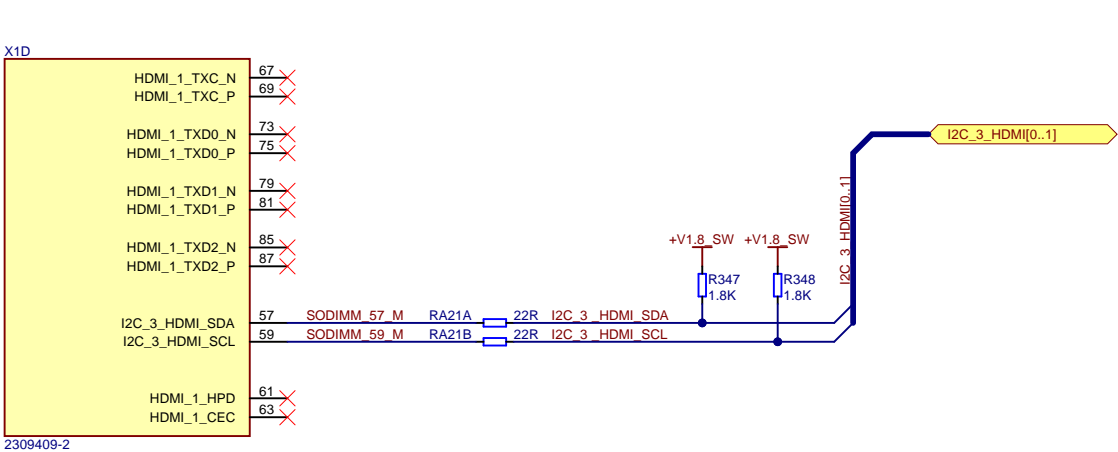
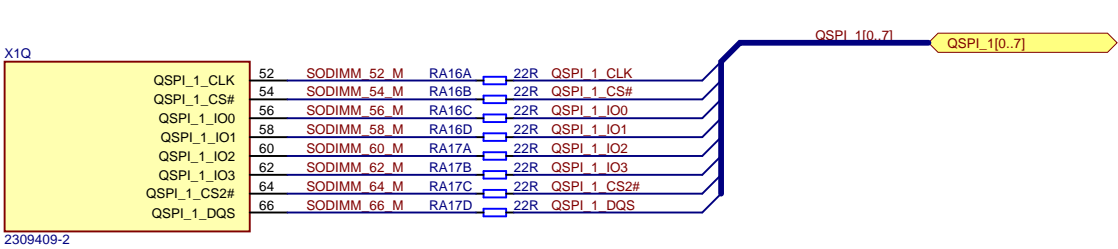
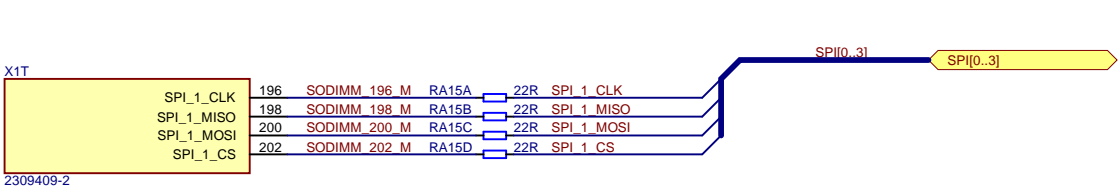
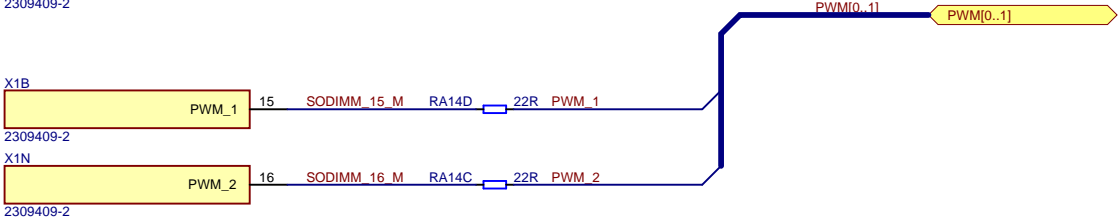
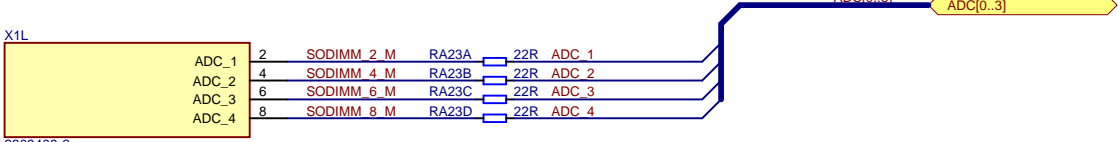
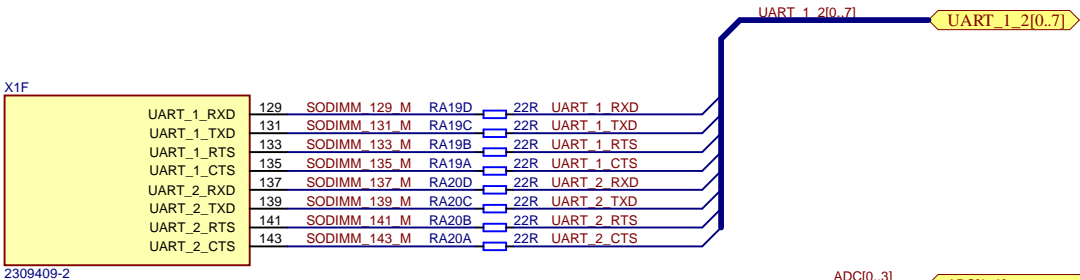
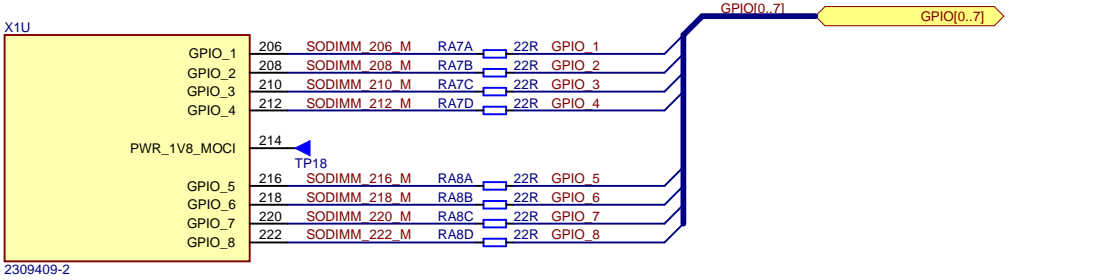




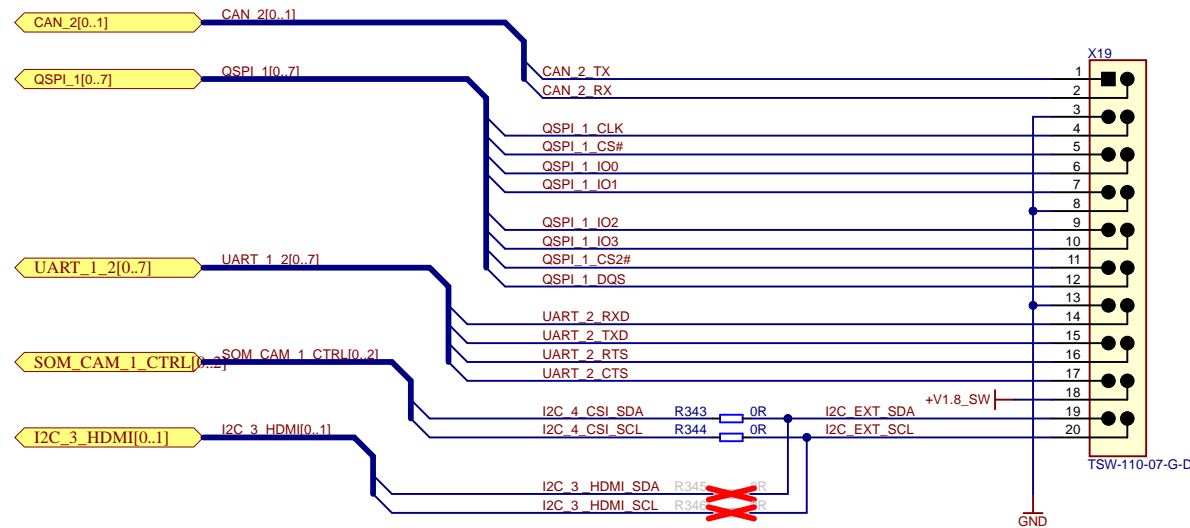
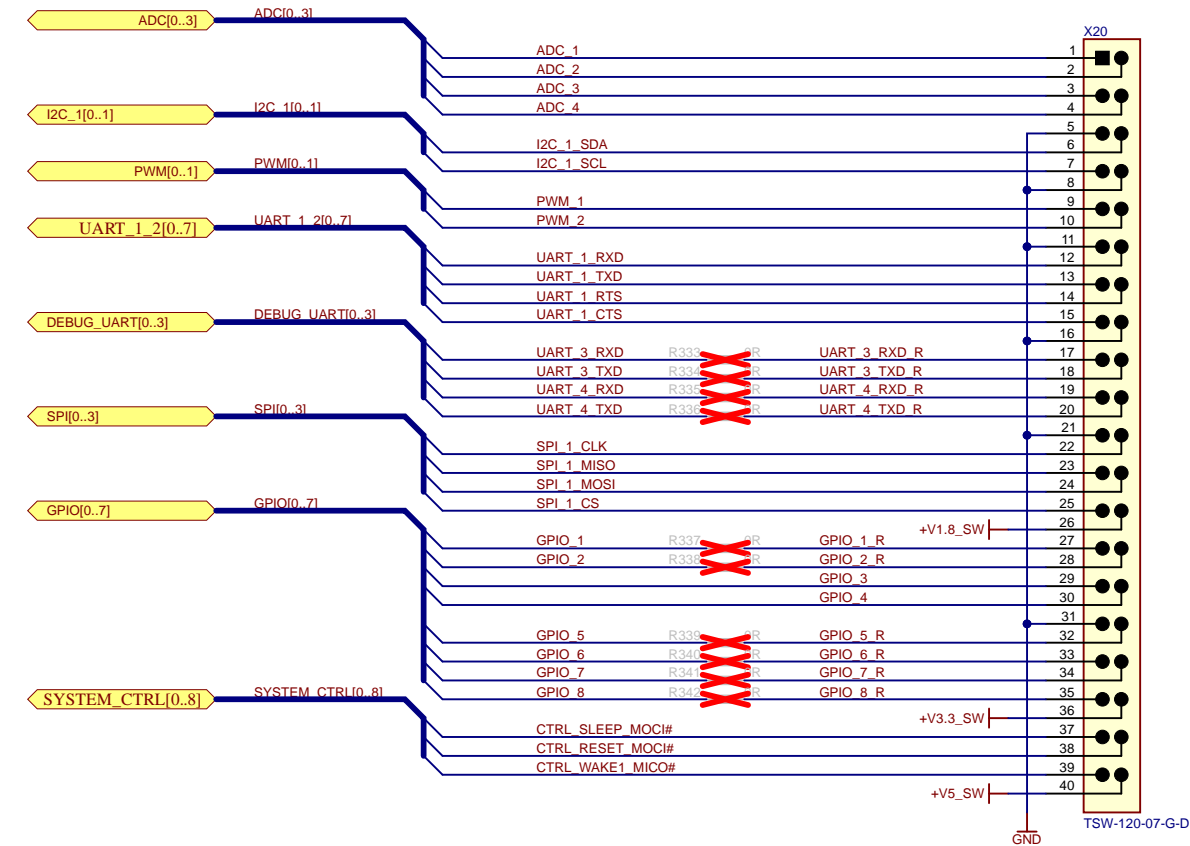
⚠ WC. Write operations are disabled to the entire memory array when Write Control (WC) is driven high. Write operations are enabled when Write Control (WC) is either driven low or left floating. When Write Control (WC) is driven high, device select and address bytes are acknowledged, Data bytes are not acknowledged.

Slave address								
1	0	1	0	E2	E1	E0	R/W	

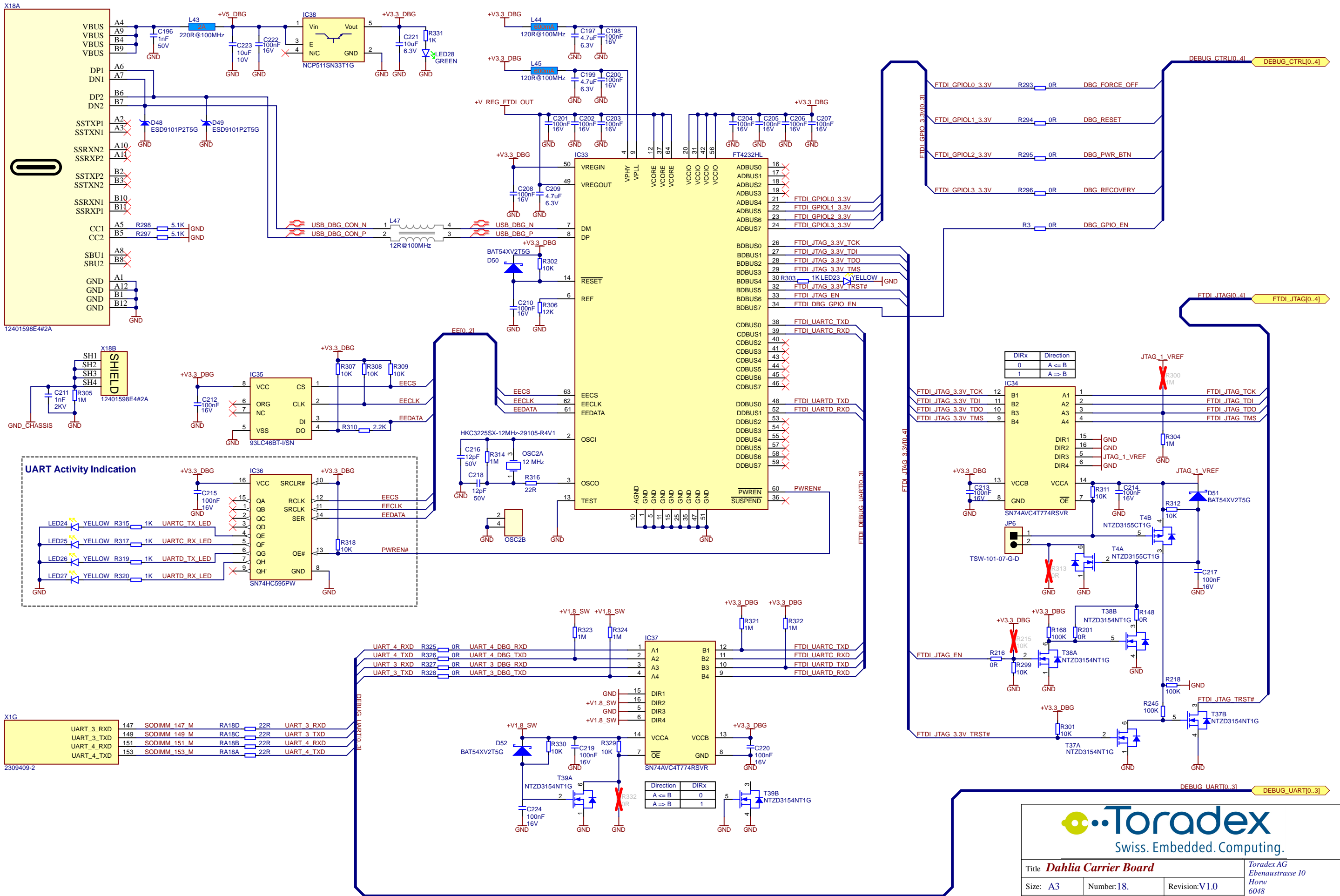
⚠ E2,E1,E0 must be tied to VCC or VSS. When not connected (left floating), these inputs are read as low (0).



Title <i>Dahlia Carrier Board</i>			<i>Toradex AG Ebenastrasse 10 Horw 6048 Switzerland</i>
Size: A3	Number: 16.	Revision: V1.0	
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File: PWM_QSPI_SPI_ADC_UART_GPIO_I2C.SchDoc			



Title <i>Dahlia Carrier Board</i>			<i>Toradex AG Ebenaustrasse 10</i>
Size: A3	Number: 17	Revision: V1.0	<i>Horw 6048</i>
Date: 5/9/2023	Time: 4:33:18 PM	Sheet 17 of 20	<i>Switzerland</i>
File: Extension.SchDoc			



1 2 3 4 5 6 7 8

A

B

C

D

1 2 3 4 5 6 7 8

X1S

TSP_1 88
TSP_2 90
TSP_3 92
TSP_4 94
TSP_5 96
TSP_6 100
TSP_7 102
TSP_8 104
TSP_9 106
TSP_10 108
TSP_11 112
TSP_12 114
TSP_13 116
TSP_14 118
TSP_15 120
TSP_16 124
TSP_17 126
TSP_18 128
TSP_19 130
TSP_20 132
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TSP_23 140
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TSP_29 154
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TSP_32 162
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TSP_34 166
TSP_35 168
TSP_36 172
TSP_37 174
TSP_38 176
TSP_39 178
TSP_40 180
TSP_41 184
TSP_42 186
TSP_43 188
TSP_44 190
TSP_45 192

X1I

ETH_2_RGMII_RXD_0 201
ETH_2_RGMII_RXD_1 203
ETH_2_RGMII_RXD_2 205
ETH_2_RGMII_RXD_3 207
ETH_2_RGMII_RXC 197
ETH_2_RGMII_RX_CTL 199
ETH_2_RGMII_TXD_3 215
ETH_2_RGMII_TXD_2 217
ETH_2_RGMII_TXD_1 219
ETH_2_RGMII_TXD_0 221
ETH_2_RGMII_TXC 213
ETH_2_RGMII_TX_CTL 211
ETH_2_RGMII_MDC 193
ETH_2_RGMII_MDIO 191
ETH_2_RGMII_INT# 189

2309409-2

2309409-2

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Title **Dahlia Carrier Board** Toradex AG
Ebenastrasse 10
Horw
6048
Switzerland

Size: A3 Number: 20. Revision: V1.0
Date: 5/9/2023 Time: 4:33:19 PM Sheet 20 of 20
File: Unused_SODIMM.SchDoc