Please check the notes appearing in red on the schematic pages. In addition, please check the Errata document of the respective product (the potential issues discovered/reported are going to appear in the Errata first). Follow the guidance provided in the relevant Carrier Board Design Guide. Please carefully review your designs against all of the sections of the Carrier Board Design Guide before proceeding with manufacturing your custom carrier board. The documents referenced are available on our Developer Website.

REVISION HISTORY

Revision V1.0

Initial release

Revision V1.1

1. Schematic library. Micro SD card logo has been embedded to the component symbol in the schematic library. Ceramic capacitors "X7R 10nF 50V 10% 0402" and "X7R 100nF 50V 10% 0402" have been added to the schematic library.

2. All schematic pages. Schematic page template has been updated.
"Port Cross Reference" has been added to the project.

3. Power switch schematic page. Capacitor C46 voltage rating has been updated from 25V to 50V.

4. LVDS schematic page. Capacitor C101 voltage rating has been updated from 16V to 50V.

5. PCIE Express schematic page. Net name has been updated from PCIE_WWLAN# to PCIE_WWAN#.

6. SD card schematic page. Conenctor X10 has been updated with Micro SD card logo embedded component symbol in the schematic page.

7. SATA schematic page. The NOTE 1 has been added to the schematic page: "NOTE 1: Mini PCIe connector schematic symbol is used in the schematic for the mSATA connector (X23), as Mini PCIe and mSATA use the same physical connector. It is important to note that the mSATA interface specifies the RX+ signal on pin 23 and RX- signal on pin 25, whereas the Mini PCIe Card features the RX+ signal on pin 25 and RX- on pin 23. The PCIe interface supports polarity reversal, but not the SATA interface. Since the Mini PCIe connector pin names doesn't match with the mSATA signals, the situation might be confusing. Special attention must be paid while reading or connecting the mSATA signals. "

8. Power Supply schematic page. Mechanical components part number have been made visible.

9. Ixora schematic library. Display name for pins 23, 25, 31, and 33 have been updated in the component "CON-Molex-67910-5700"

10. SATA and PCI_Express schematic pages. Connector X23 and X25 schematic symbols have been updated.

11. Hardware Architecture page. Hardware architecture block diagram has been updated.

12. Power Supply schematic page. Comments near capacitors C7 to C12 have been updated.

13. Power Switch schematic page. MOSFET T8 and T10 have been replaced with new parts (Diodes Inc, Part Number: DMP4015SSS-13) having better Vgs rating. Zener diodes (On Semi, Part Number: MM3Z20VT1G) D14 and D16 have been added for MOSFETs gate protection. Inductor L4 and current sense resistor R9 have been changed to increase the output rating of the 3.3V power supply. WAKE1_MICO# signal has been pulled up to 3.3V (via R146) instead of 3.3V_SW.

14. RTC schematic page. By default, EEPROM circuit (IC14, C97, R92, R93, R94, R95) are not assembled. 2x BAT54 diodes D3 and D4 have been replaced with single BAT54C diode D3.

15. USB Connectors and PCI Express schematic pages. USB power switch (IC7) has been replaced with higher current rating USB switch (TI, Part Number:TPS2066CD, overcurrent limit 1A). USB2 and USB3 interface connections have been swapped to ensure compatibility with the Apalis TK1 module. As default assembly, USB2 has been connected to the PCIe connector and USB3 has been connected to the connector X7 (USB 1 connector).

16. SDCard schematic page. Apalis MMC interface has been used (4 bit mode) in place of Apalis SD interface. Micro SD Card holder X10 has been replaced with new connector (Wurth, Part Number: 693071010811). The NOTE 2 has been added in the schematic page.

17. Audio schematic page. Biasing circuit for the microphone input has been added.

18. Camera Interface schematic page. MIPI CSI connector X28 has been added. Recovery mode jumper JP4 has been added.

19. RGB Display schematic page. Capacitive touch connector X24 has been added.

20. LVDS schematic page. I2C2 signals have been connected to the connector X19, pin 36 and 38.

20. LVDS schematic page. I2C2 signals have been connected to the connector X19, pin 36 and 38.

21. CAN schematic page. By default, CAN bus termination resistors R107, R108, R113, R114 and capacitors C112, C121 are not assembled.
22. Extension schematic page. MXM3_180, MXM3_186 and MXM3_176 have been connected to UART2/3_RS232_FOFF#, FACTORY_DEFAULT# and PCIE_WDISABLE#_R signals respectively. MXM3_188
and MXM3_178 have been used to control LED_4 (LED_4_GREEN and LED_4_RED) respectively.

23. HDMI schematic page. The NOTE 3 has been added in the schematic page.

24. Power switch schematic page. The NOTE 4 has been added in the schematic page.

Revision V1.2

1. Hardware Architecture page. Hardware architecture block diagram has been updated.

2. Power Supply schematic page To improve EMI/ESD performance of the board CHASSIS_GND has been implemented.

3. Power Switch schematic page. New DC-DC Buck / Step-down regulators have been used, in order to increase the output power of the 3.3V and 5V_SW power supply. SH1 and SH2 pins of the tactile switches (SW1, SW2) are connected to CHASSIS_GND. Note 4 has been updated.

4. RTC schematic page. New EEPROM (AT34C02D-XHM-B, TSSOP-8 package) has been added.

5. USB Connector schematic page. New microUSB connector has been used (Hirose, ZX62-AB-5PA(31)). USB connectors (X7, X8, X9) shield circuit has been updated to improve EMI/ESD performance.

6. SDCard schematic page. SD card holder S1, S2 pins are now connected to GND. ESD protection diode (D4) has been added to MMC_CD1 and MMC_CD2 signals. SD card pull-up resistors (R60, R61, R62, R63, R64) are not assembled by default. Load switch (IC22; Microchip MIC94070YMT-TR) has been added to control SD card power. MXM3_148/MMC1_D4 pin is used enable/disable the load switch for SD Card power. MXM3_158/MMC1_D7 pin is used enable/disable the load switch for CAN1 interface power.

7. Ethernet schematic page. New RJ45 connector (X11; BEL Fuse A829-1J1T-KM; -40C to 100C operating temperature range) has been used. Components L20, C72, C73, R73, R74, R74, R76 are not assembled by default. NOTE 5 has been added in the schematic page. RJ45 connector (X11) shield circuit has been updated to improve EMI/ESD performance.

8. Audio schematic page. Capacitors C85 and C86 value has been changed to 4.7uF/10V. The X12 audio jeck connector pinout scheme is changed from OMTP to CTIA.

9. HDMI schematic page. New Voltage Level Shifter and ESD protection solution (IC9; Nexperia IP4786CZ32) has been used.

10. CAN schematic page. Load switch ICs (IC18, IC19,IC20, IC21; Microchip MIC94070YMT-TR) have been added to control CAN1 and CAN2 interface power rails.

11. SATA schematic page. Capacitors C164 (47uF) and C165 (47uF) have been added. MXM3_35/SATA1_ACT# pin has been used to enable/disable the load switch for CAN2 interface power.

12. PCI Express schematic page. Capacitors C162 (47uF) and C163 (47uF) have been added.

13. Extension schematic page. MXM3_190 pin has been connected to shared pads resistors (R154, R155), as it may detect undesirable SD card detect interrupts. SH1 and SH2 pins of the tactile switch (SW3) are connected to CHASSIS_GND.

14. Mechanicals schematic page. New schematics page added for mechanical components.

Revision V1.3

1. The following 100K pull resistors are replaced by 10K resistors (R-100KR-63mW-5%-0402 -> R-10K-63mW-5%-0402):
R3, R48, R52, R57, R59, R65, R85, R88, R89, R116, R134, R146, R154, R159, R160, R167.

2. The C-X5R-10u-50V-10%-1210 capacitors are changed to C-X5R-10uF-50V-20%-1206. The following components are affected: C4, C5, C6, C21, C22, C30, C31, C44, C47.

3. ESD protection has been added to the following interfaces: Audio, Micro SD, Touch, Ethernet, CAN, and Push Buttons.
The USB ESD protection has been updated to use the same device used on other interfaces and therefore reduce the BOM.

4. The transistor-based (T17) adaption threshold circuit is added to ensure IC15 power-off.

5. IC18, IC19, IC20, and IC21 are changed to the MIC94073YMT-TR.

6. IC12 and IC13 are replaced to MAX3243IDBR.

7. R2 and R49 values are decreased to 10K.

8. The X26 footprint is changed to improve the assembly process.

9. C166 and C167 capacitors are added to improve the converter's stability.

10. L5 is changed to Vishay IHLP4040DZER3R3M01.

11. Silkscreen and CE Marking are improved.

12. The L21 ferrite bead is replaced by 0R R207 resistor.

13. C57, C60, C63 capacitors are connected closer to the connector. The USB connector GND lines are connected directly without ferrite beads and the USB power line capacitance is increased (C135, C168, and C169 are added) to comply with USB specification.

14. The X1 connector is changed to CON-JAE-MM70-314B1-2-R300-0.5mm, since the current connector is end-of-life (EOL).

15. The X9 footprint mounting holes are decreased to improve the assembly. Paste areas are updated according to the recommendations from the EMS.

16. IC10, IC11 CAN Transceivers are changed to ADM3057 to enable Ixora to support CAN FD.

17. The HDMI connector part has been changed to be compliant with HDMI 2.0 specification.
TVS diode D45 has been added to the 5V power pin of the HDMI connector X17.

18. 10k resistor R209 pulling the WAKE1_MICO# Net to the 3.3V_SW power rail has been added.
10k resistor R146 has been marked as "Not Assembled".

19. Transistor T2 (IRLML6401PBF) has been removed. The 0402 100k resistor R210 has been added and the transistor T3 part number changed from SI-1024-X to NTZD3155CT1G.

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Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
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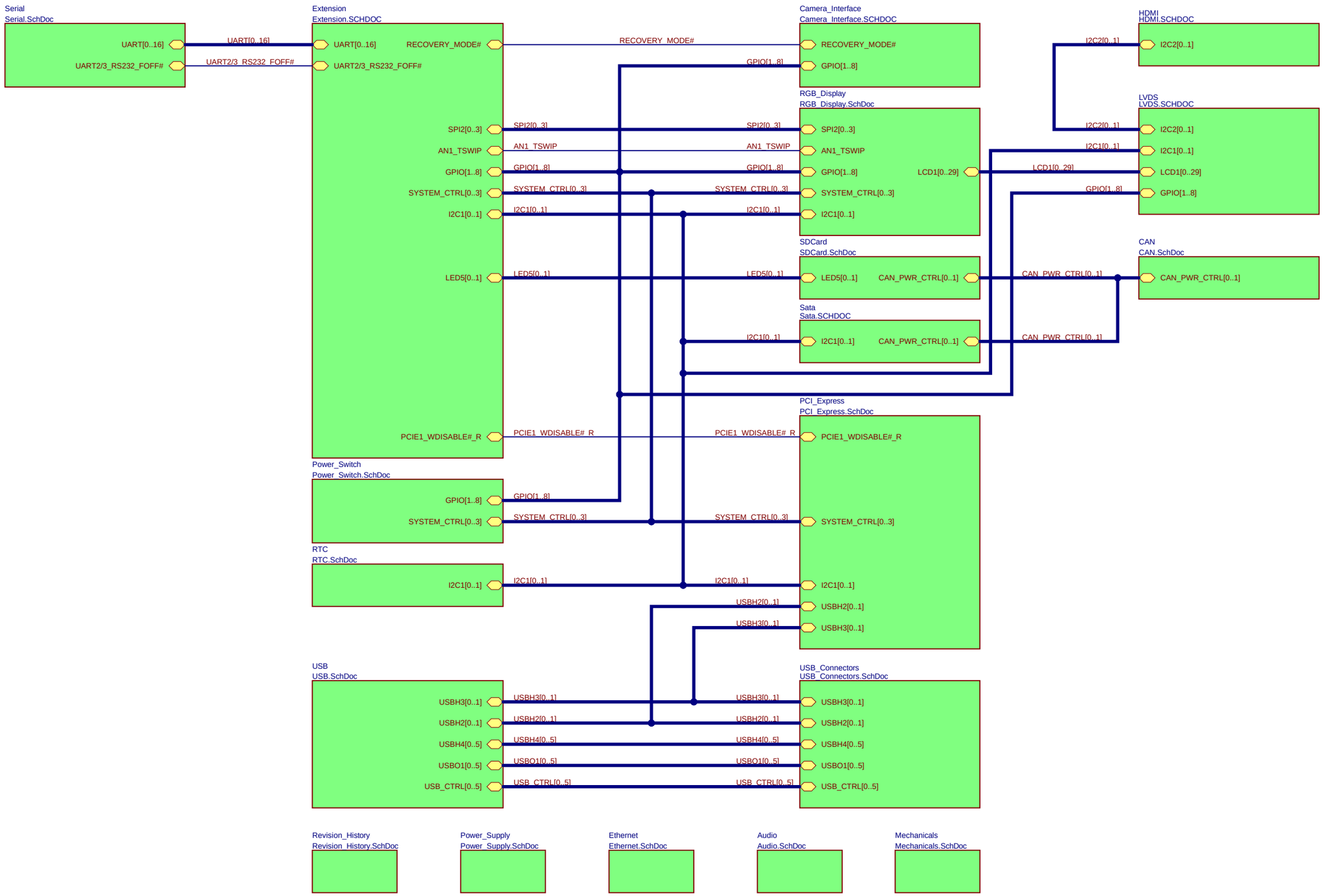
Date: 5/7/2023 Time: 9:23:37 PM		Sheet 1 of 20	
File: Revision_History.SchDoc			



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Title *Ixora*			*Toradex AG*
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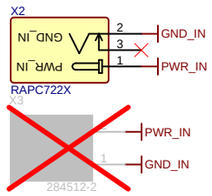
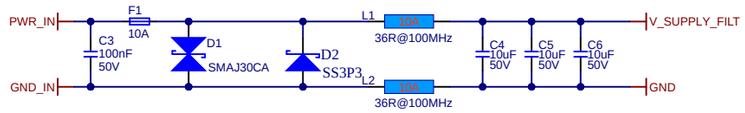
Date: 5/7/2023	Time: 9:23:37 PM	Sheet 2 of 20	*Horw*
File: Hardware_Architecture.SchDoc			*6048*
			Switzerland

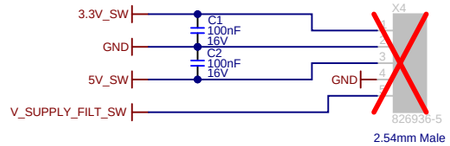
POWER INPUT (Vin = 7V to 27V)



EMI INPUT FILTER

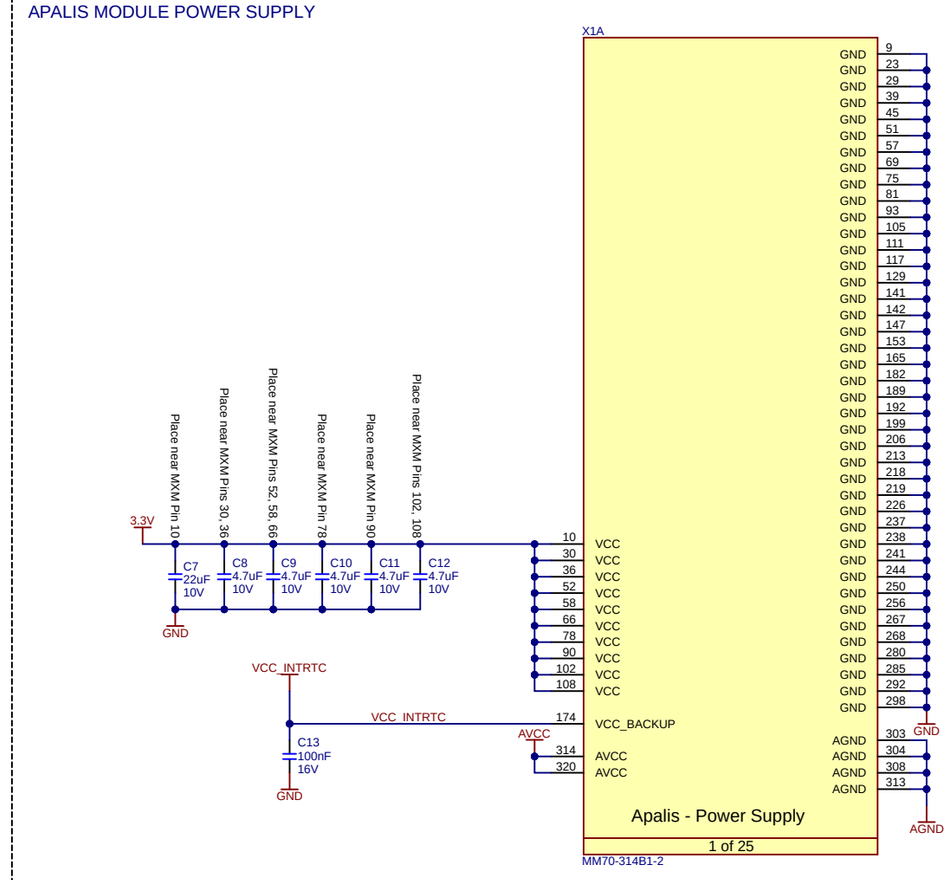


POWER OUTPUT HEADER



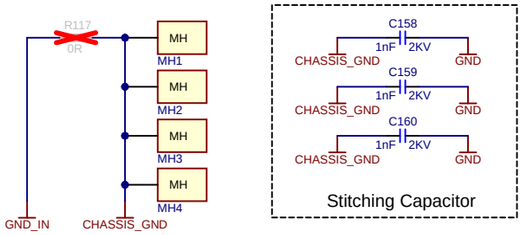
POWER SUPPLY INDICATION (3.3V_SW)

APALIS MODULE POWER SUPPLY



TEST POINTS

CHASSIS GROUND



- CHASSIS_GND should be connected to GND_IN only at one point, near the input power connector.
- Don't create a closed loop for CHASSIS_GND on the PCB, to avoid any loop current.

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Title *Ixora*		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:3	Revision:V1.3
Date: 5/7/2023 Time: 9:23:37 PM	Sheet 3 of 20	
File: Power_Supply.SchDoc		

PUSH BUTTON CONTROLLER

ALWAYS ON JUMPER

JP1
2.54mm Male

STANDBY VOLTAGE LDO

NCV4274CST50T3G

POWER ON/OFF BUTTON

SW1
TL3340AF160QG

RESET BUTTON

SW2
TL3340AF160QG

SSW-103-01-G-D
2.54mm Female

NC7SZ126M5X

RESET LED

LED active LOW
SLED2
HSMS-C190
RED

LTC2954ITS8-2#PBF

ESD9101P2T5G

T3B NTZD3155CT1G
T3A NTZD3155CT1G
T6A SI-1024-X
T6B SI-1024-X

POWER SUPPLY REGULATORS (BUCK / STEP-DOWN)

Soft Start Time:
Tss(us) = 330 x Css(nF)

IC2
AOZ2261AQI-10

IC15
AOZ2260AQI-10

LOAD SWITCH: 3.3V_SW

T5 DMP2022LSS-13
T7A SI-1024-X
T7B SI-1024-X

LOAD SWITCH: V_SUPPLY_FILT_SW

T8 DMP4015SSS-13
T9 BSS138-7-F

FAN CONTROL POWER SWITCH

T10 DMP4015SSS-13
T11 BSS138-7-F

ADAPTION THRESHOLD

T17 BC856B

X1D
Apalis - System Control
4 of 25
MM70-314B1-2

X6
22-11-2032

REVISION HISTORY NOTES

NOTE 4: Pinout for the AOZ226x for IC2 & IC15 used in this page is a modified pinout, combining multiple devices from Alpha and Omega family AOZ226x products. Please refer device respective device datasheets for details (look for pin 22, 23 details)

Assembly Options for 3.3V DC-DC step-down power supply:
AOZ2261: assemble R157, unassemble R4

Assembly Options for 5V DC-DC step-down power supply:
AOZ2260: assemble R10, unassemble R16

Alternate parts for L4 and L5:
- Inductance (L) = 2.2uH: Abracon, ASPIAIG-F1040-2R2M-T; Pulse, PA4342.222NLT; Bourns, SRP1038A-2R2M; Wurth, 7443330220
- Inductance (L) = 3.3uH: Abracon, ASPIAIG-F1040-3R3M-T; Pulse, PA4342.332NLT; Bourns, SRP1038A-3R3M; Wurth, 7443330330
- Inductance (L) = 4.7uH: Abracon, ASPI-1040HI-4R7M-T05; Pulse, PA4342.472NLT; Bourns, SRP1038A-4R7M; Wurth, 7443330470

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Title: *Ixora*			*Toradex AG Ebenaustrasse 10 Horw 6048 Switzerland*
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Date: 5/7/2023 Time: 9:23:37 PM		Sheet 4 of 20	
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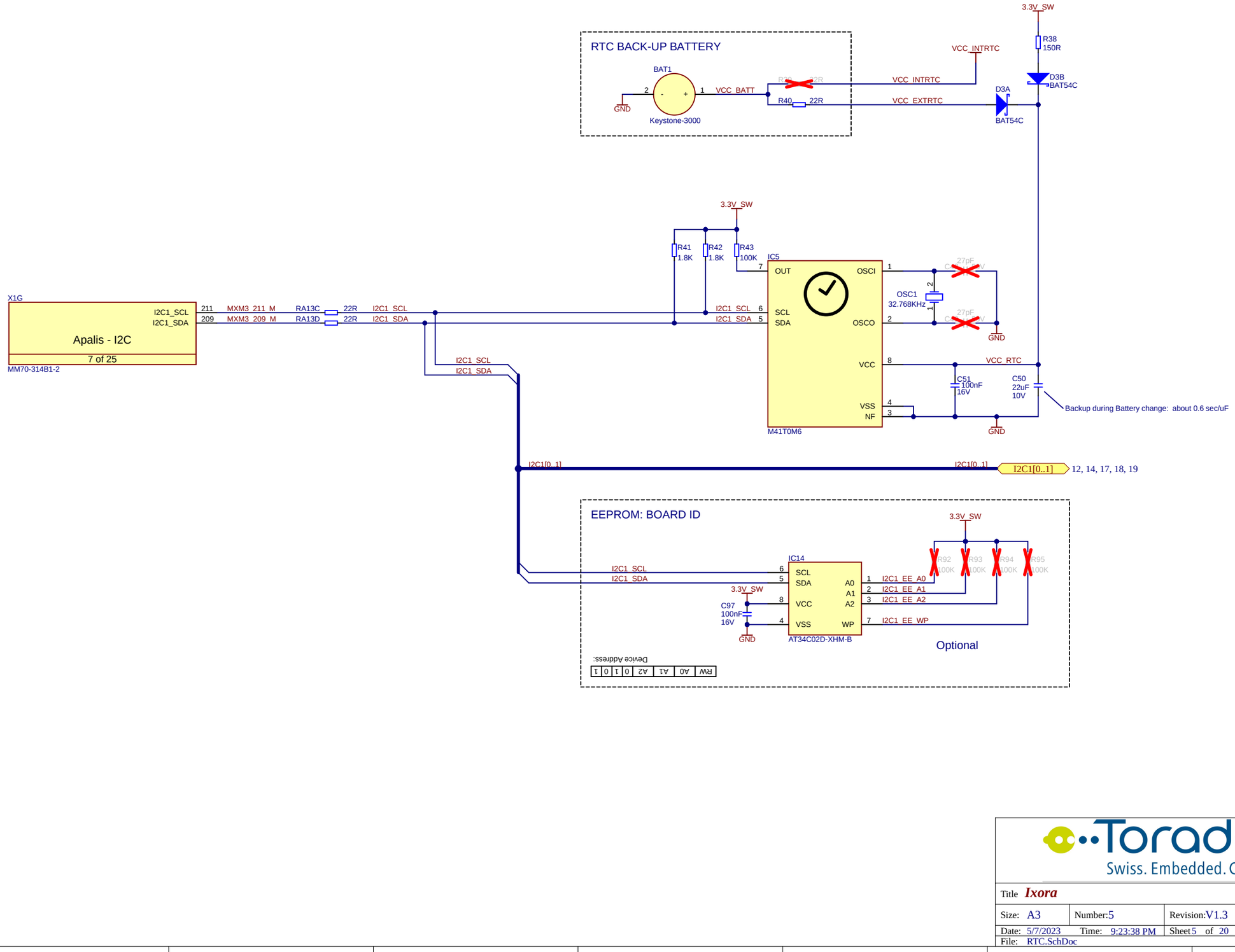

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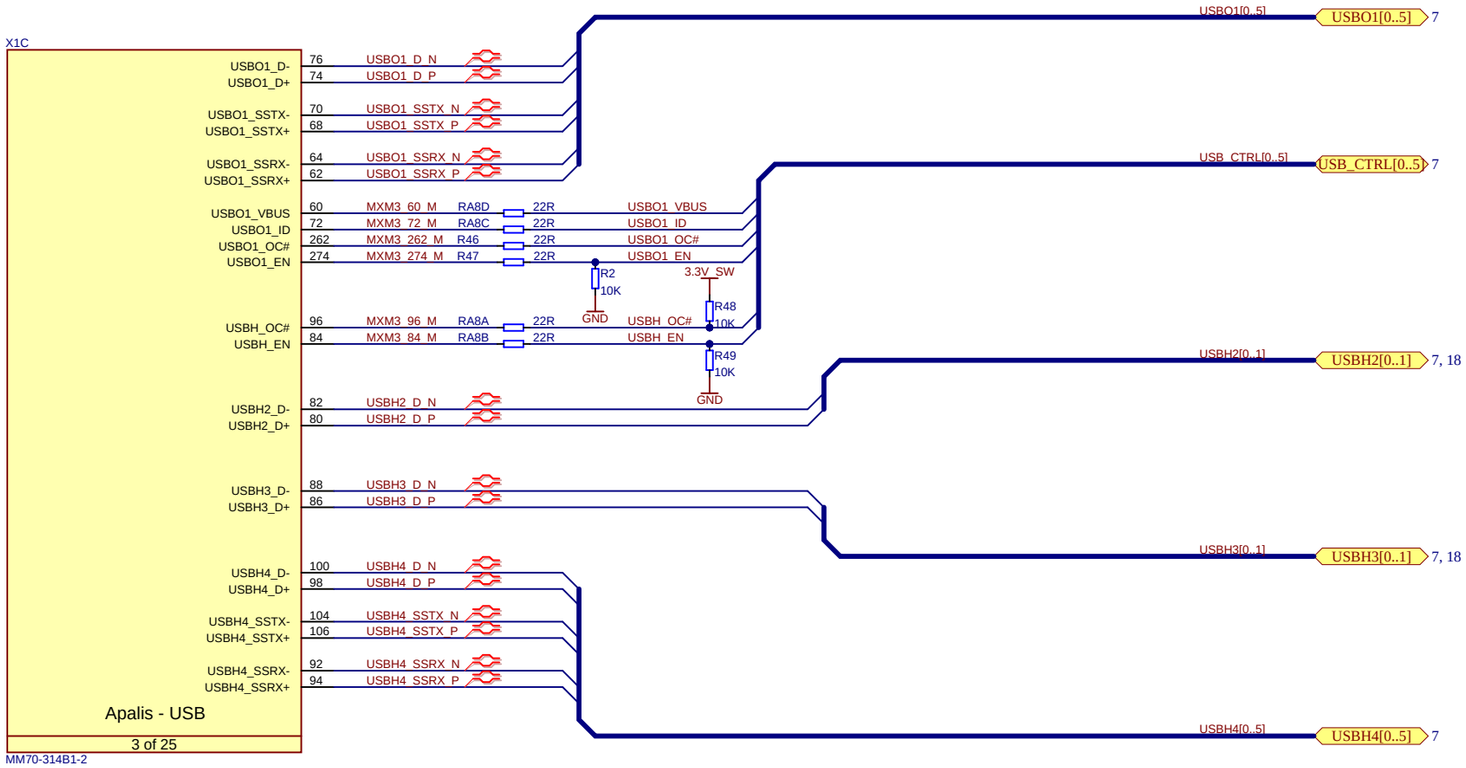
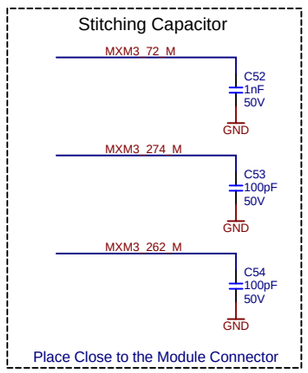
Date: 5/7/2023 Time: 9:23:38 PM		Sheet 5 of 20	
File: RTC.SchDoc			





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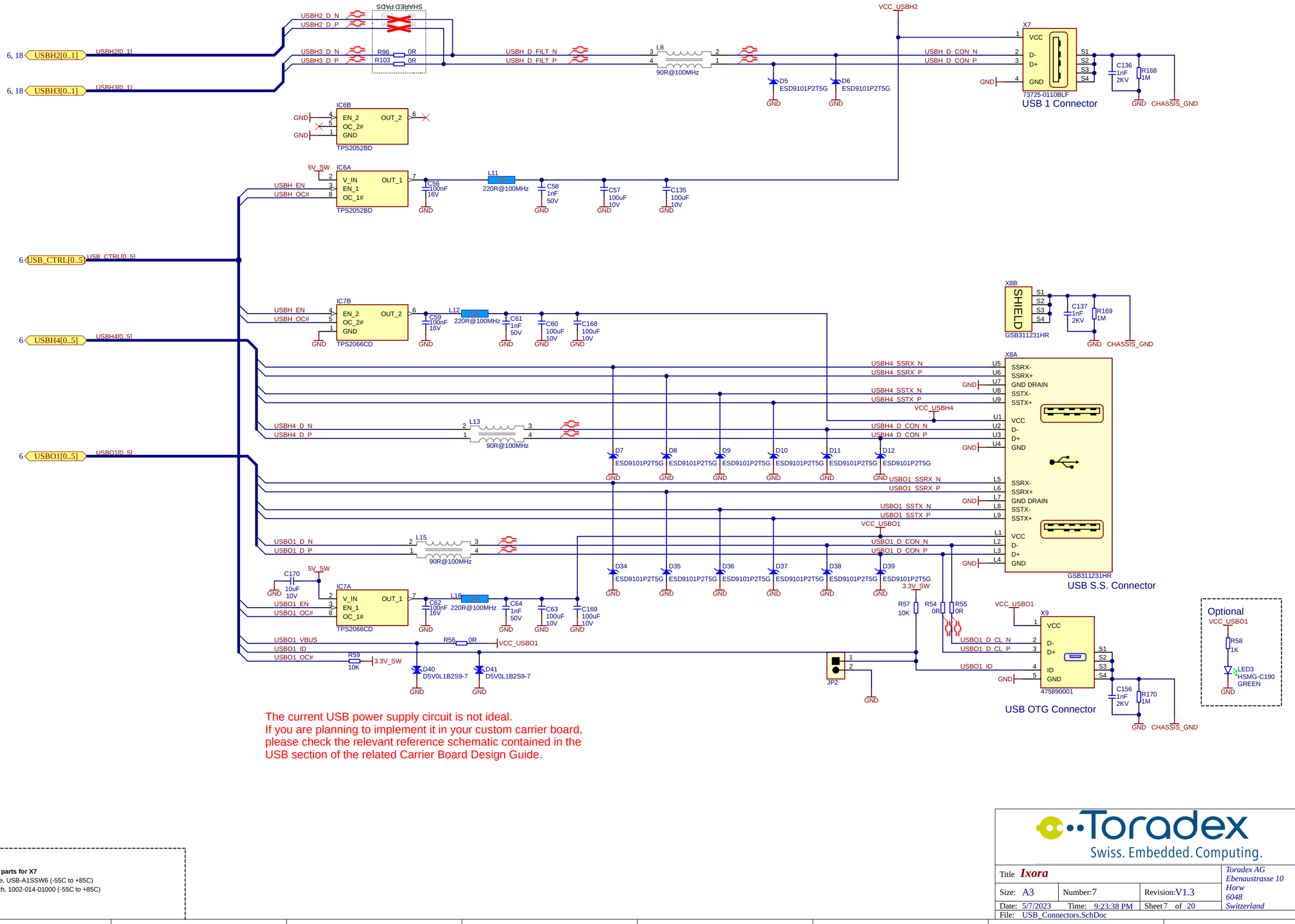
Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:6	Revision:V1.3	
Date: 5/7/2023 Time: 9:23:38 PM		Sheet 6 of 20	
File: USB.SchDoc			



The current USB power supply circuit is not ideal.
If you are planning to implement it in your custom carrier board, please check the relevant reference schematic contained in the USB section of the related Carrier Board Design Guide.

Alternate parts for X7
- On Shore, USB-A1SSW6 (-55C to +85C)
- CNC Tech, 1002-014-01000 (-55C to +85C)

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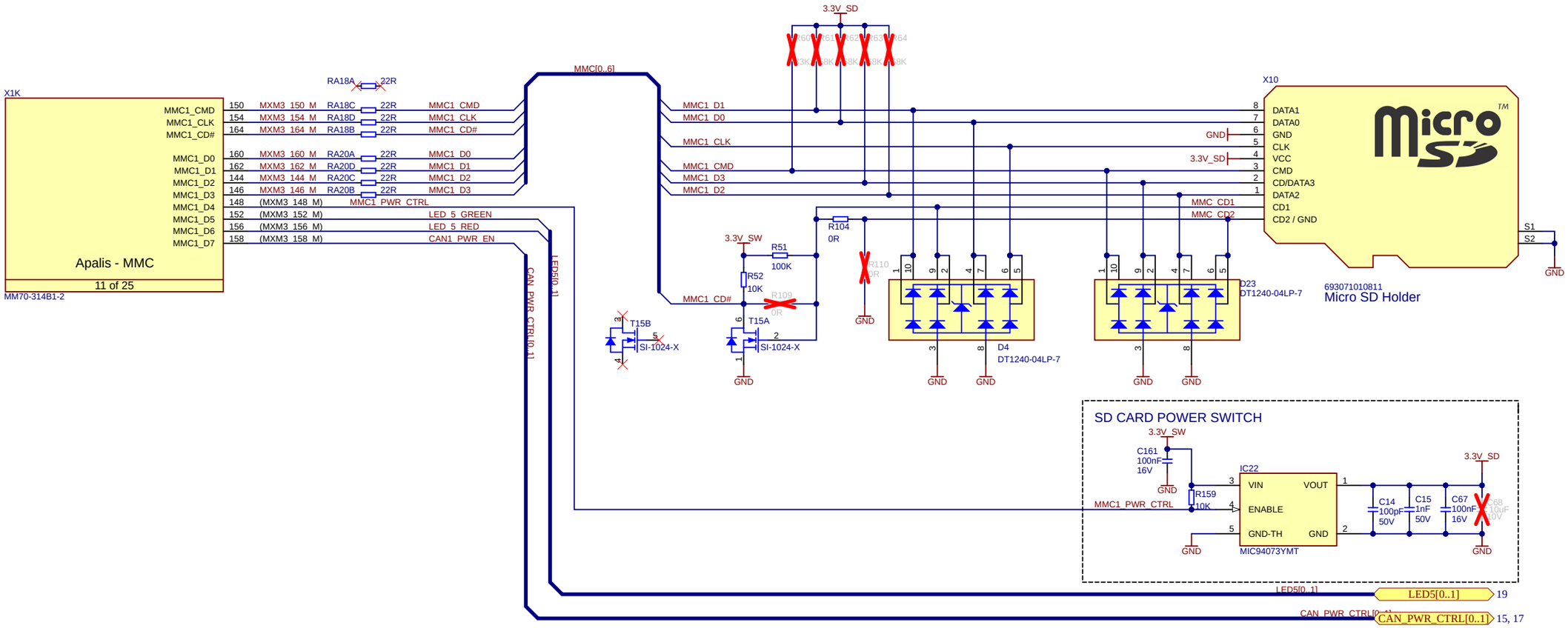
Title *Ixora*			*Toradex AG*
Size: A3	Number:7	Revision:V1.3	*Ebenaustrasse 10*
Date: 5/7/2023	Time: 9:23:38 PM	Sheet 7 of 20	*Horw*
File: USB_Connectors.SchDoc			*6048*
			Switzerland



REVISION HISTORY NOTES

NOTE 2: Assembly options for the different MicroSD Card connectors:

Option 1 (default assembly): Wurth, 693071010811 ; GCT, MEM2061-01-188-00-A ; Amphenol, 101-00581-59
Assemble (R51, R52, R104, T5), Disassemble (R109, R110)

Option 2: Amphenol, 101-00660-68-6 (alternate assembly)
Assemble (R52, R109, R110), Disassemble (R51, R104, T5)

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Title: *Ixora*		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number: 8	Revision: V1.3
Date: 5/7/2023 Time: 9:23:38 PM	Sheet 8 of 20	
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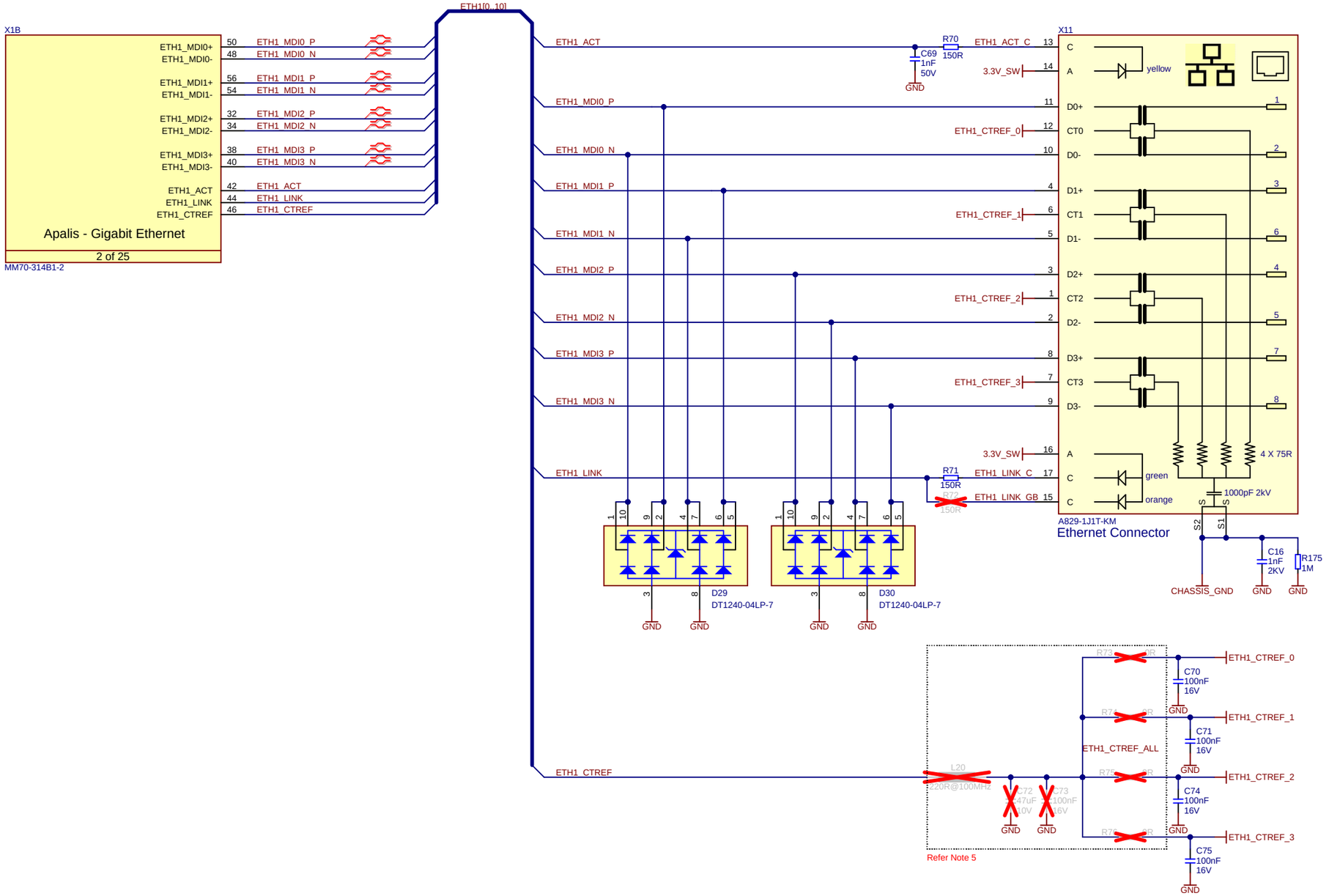

REVISION HISTORY NOTES

NOTE 5: For Ethernet to be compliant with 10Base-T, Ferrite Bead L20, Capacitors C72, C73 and Resistors R73, R74, R75 and R76 should not be assembled. Please refer to the Ixora Errate for more details.

Alternate parts for X11

- TRP Connectors, 2250548-1 (-40 to 100C)

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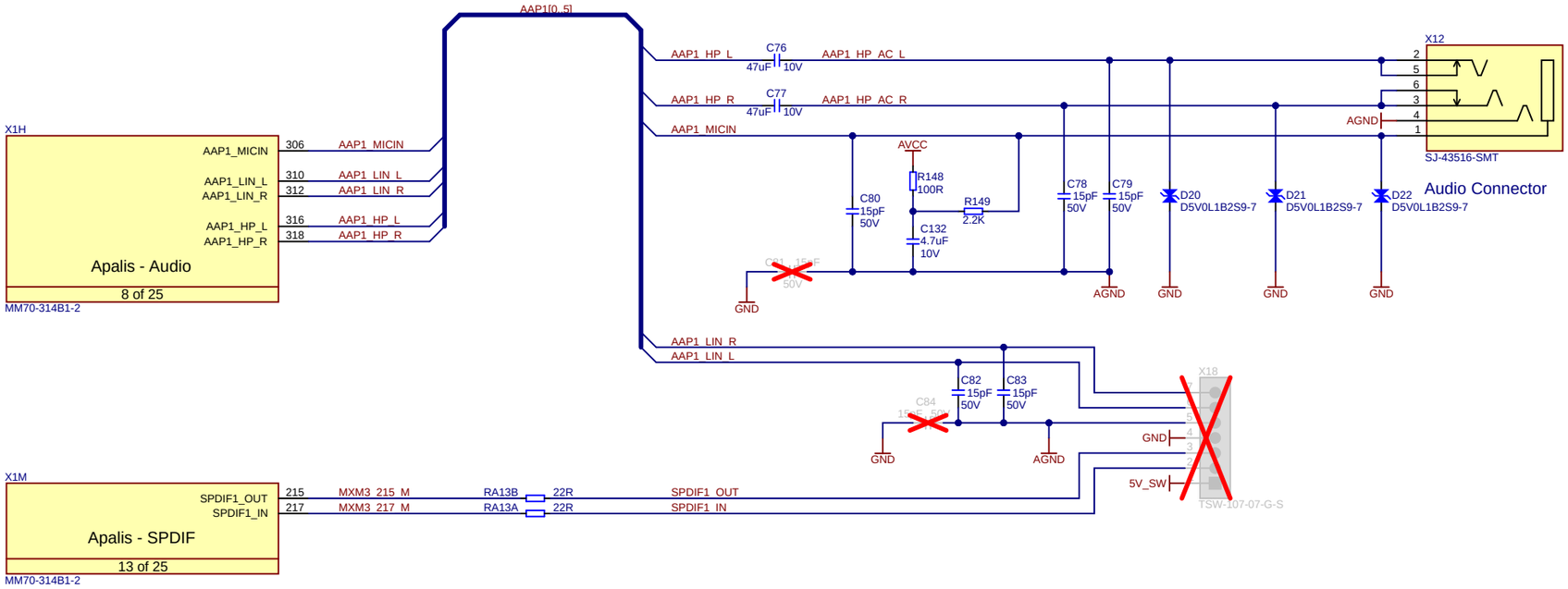
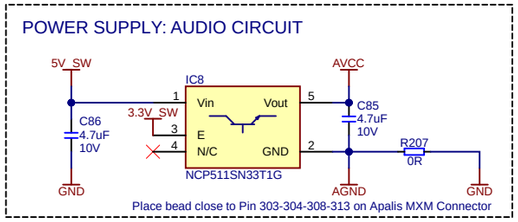
Title *Ixora*			*Toradex AG*
Size: A3	Number:9	Revision:V1.3	*Ebenaustrasse 10*
Date: 5/7/2023 Time: 9:23:39 PM		Sheet 9 of 20	*Horw*
File: Ethernet.SchDoc			*6048*
			Switzerland





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Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
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Date: 5/7/2023 Time: 9:23:39 PM		Sheet 10 of 20	
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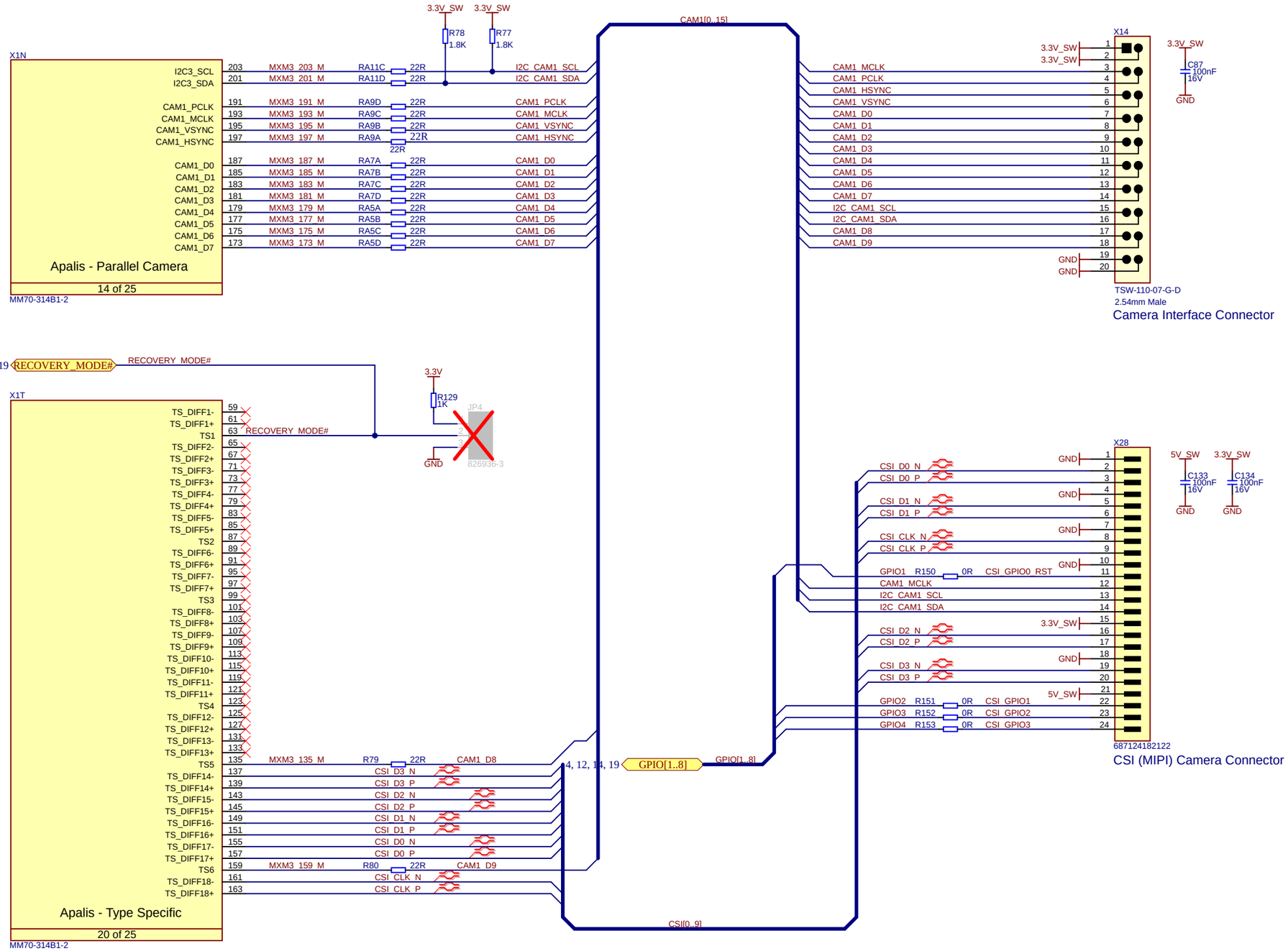

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Title	***Ixora***		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
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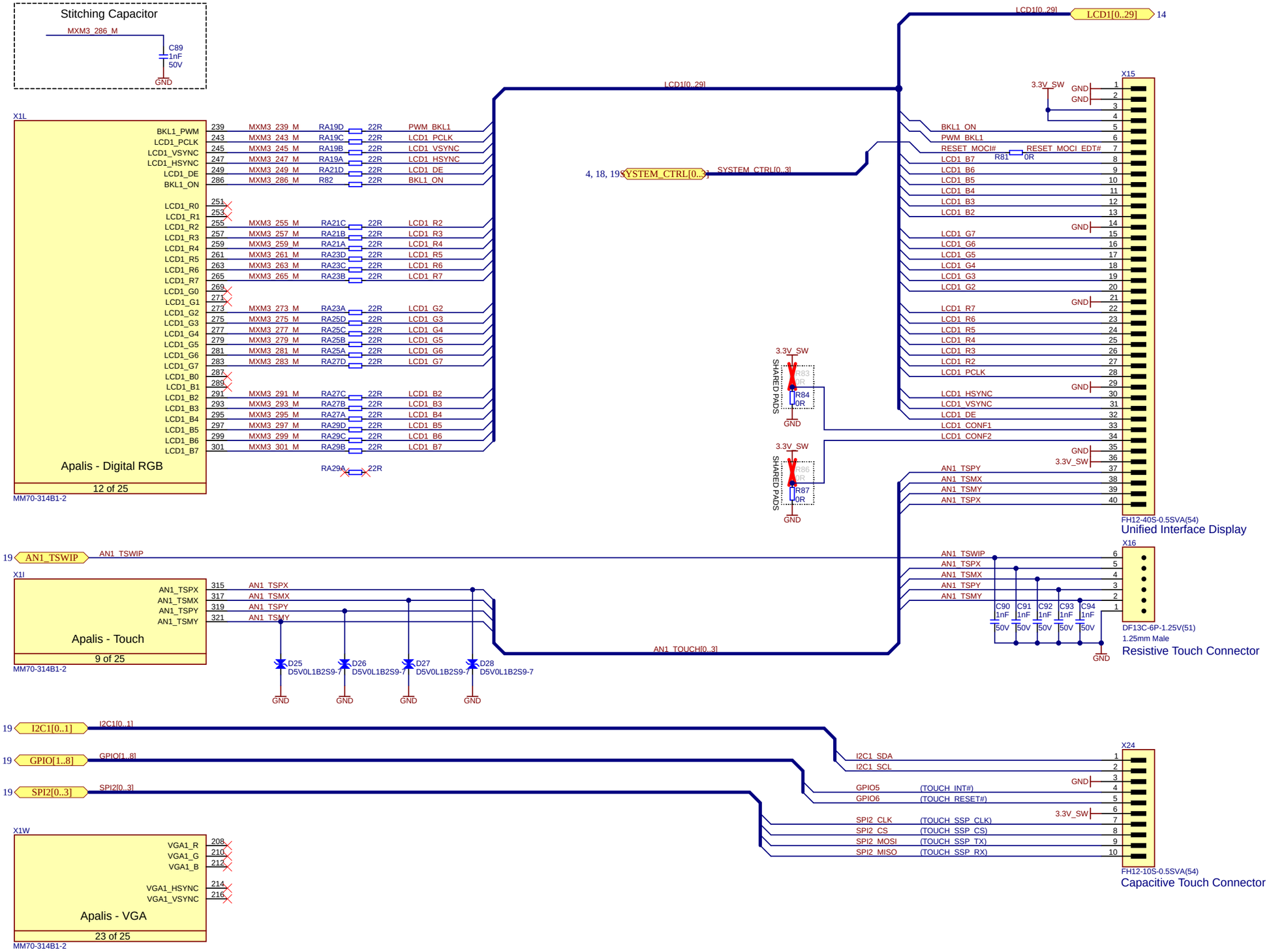
Date: 5/7/2023	Time: 9:23:39 PM	Sheet 11 of 20	
File: Camera_Interface.SCHDOC			



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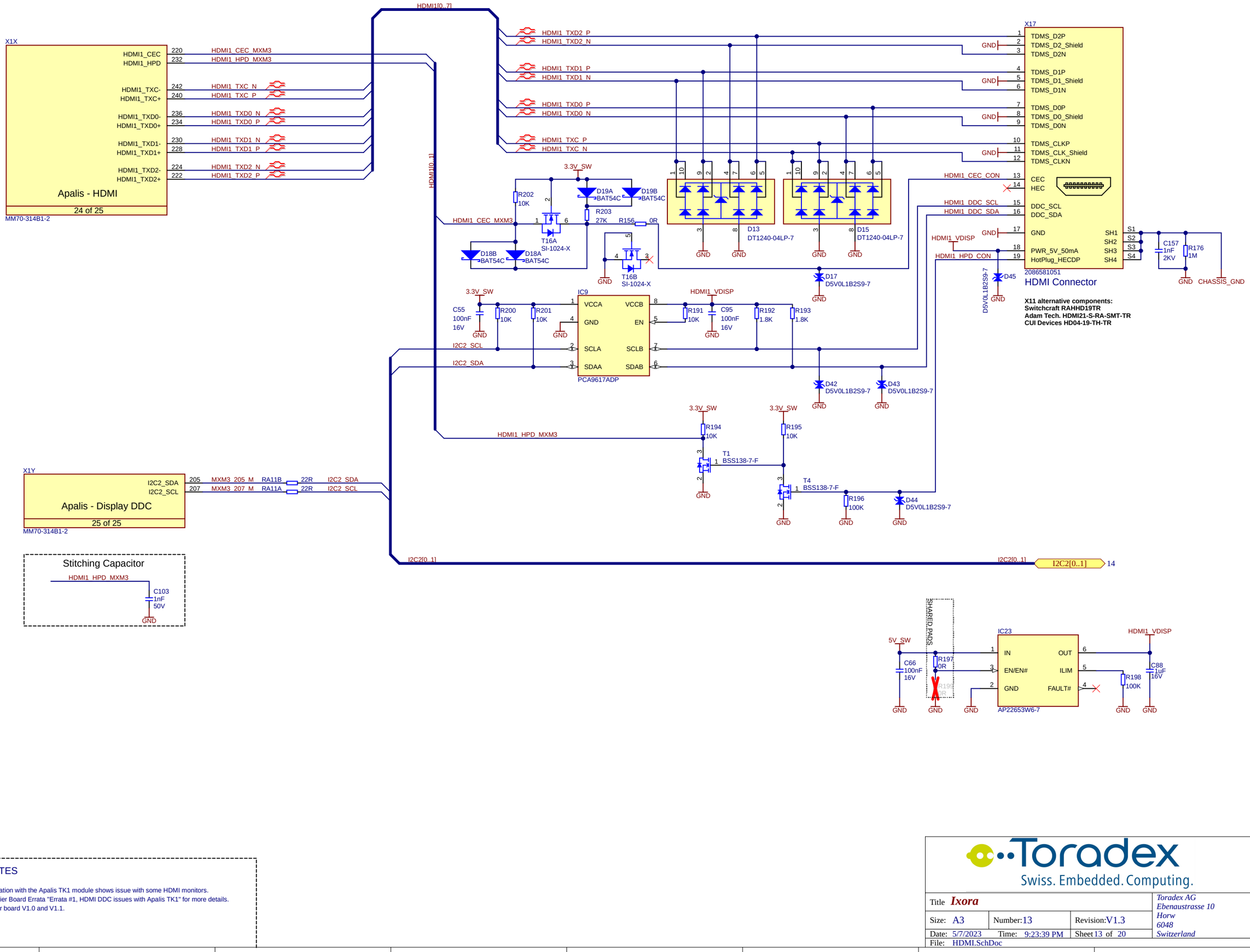
Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:12	Revision:V1.3	
Date: 5/7/2023 Time: 9:23:39 PM		Sheet 12 of 20	
File: RGB_Display.SchDoc			



REVISION HISTORY NOTES

NOTE 3: Ixora carrier board in combination with the Apalis TK1 module shows issue with some HDMI monitors.
Please refer to the Ixora Carrier Board Errata "Errata #1, HDMI DDC issues with Apalis TK1" for more details.
The issue affects Ixora carrier board V1.0 and V1.1.

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Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:13	Revision:V1.3	
Date: 5/7/2023	Time: 9:23:39 PM	Sheet 13 of 20	
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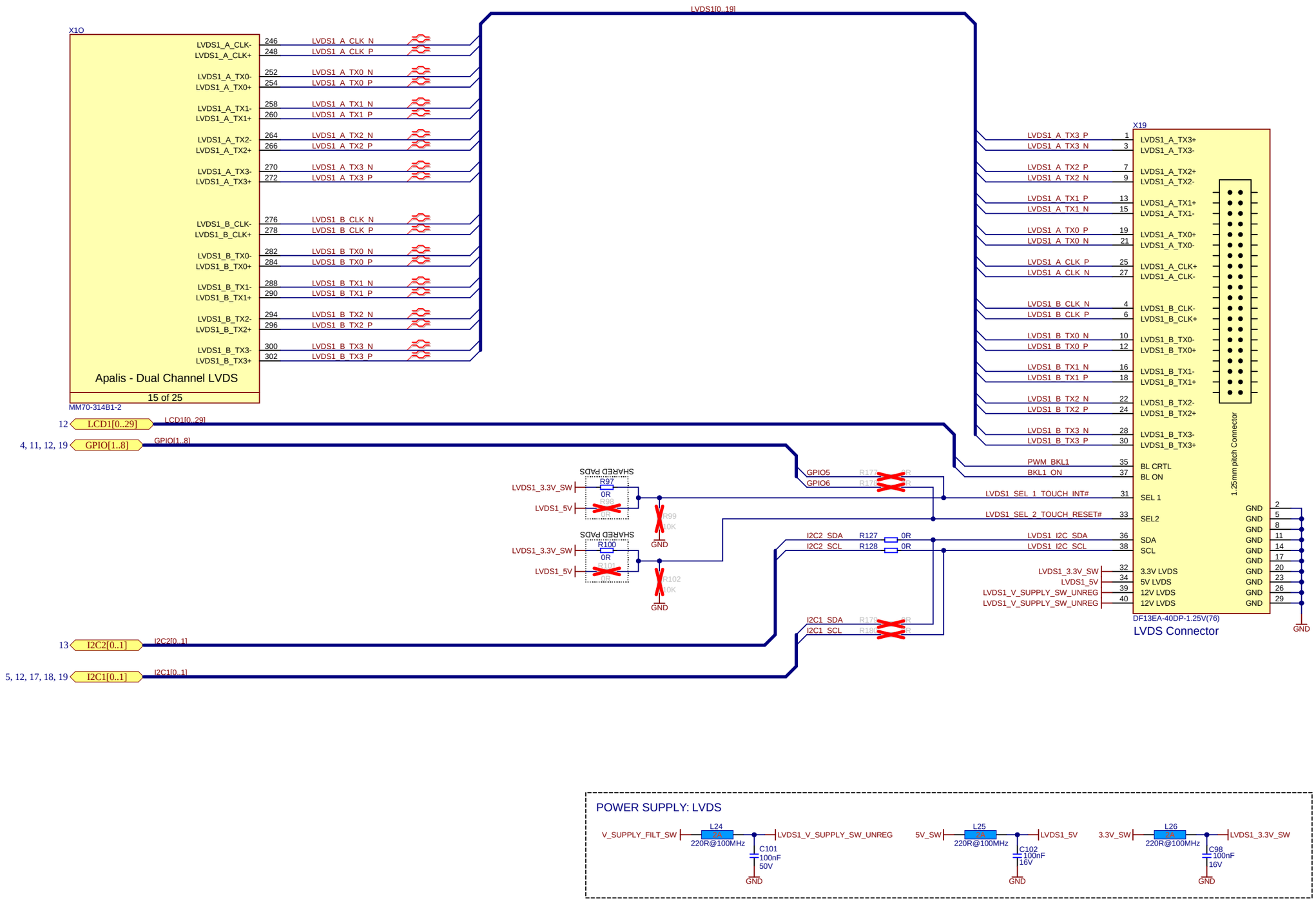

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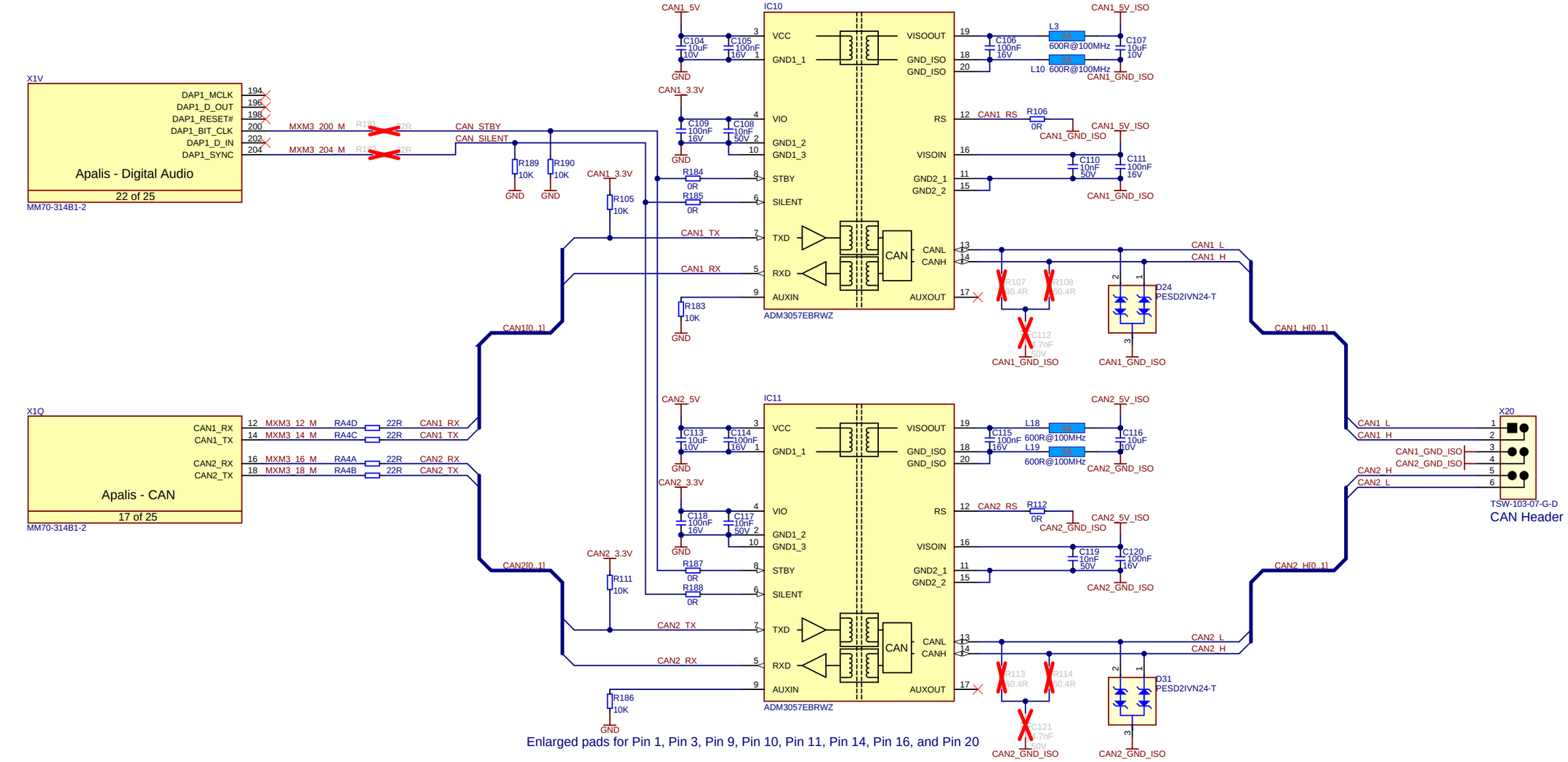
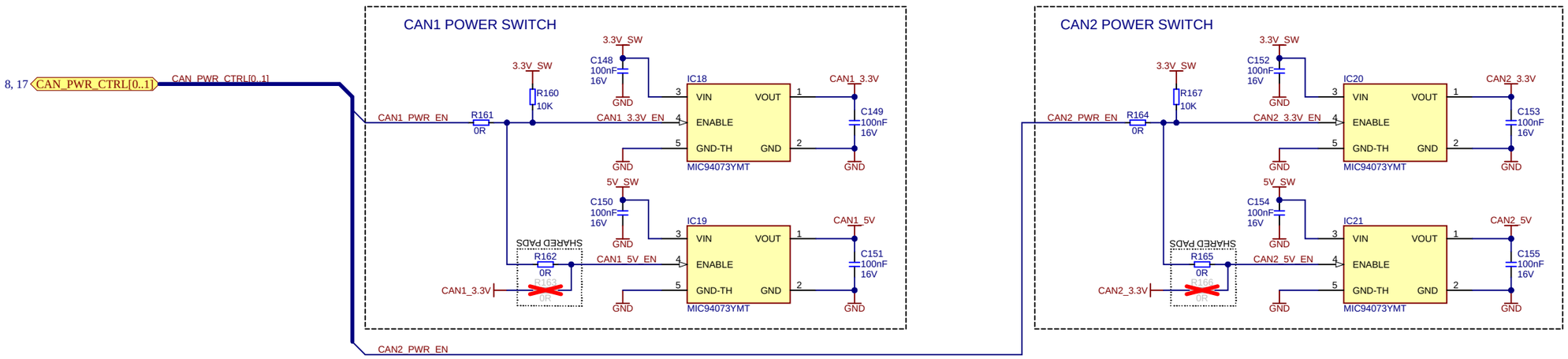


Enlarged pads for Pin 1, Pin 3, Pin 9, Pin 10, Pin 11, Pin 14, Pin 16, and Pin 20



Alternate parts for IC18, IC19, CI20, IC21:
- Alpha & Omega, AOZ1321DI-06
- MPS, MP62040DQFU-LF-Z

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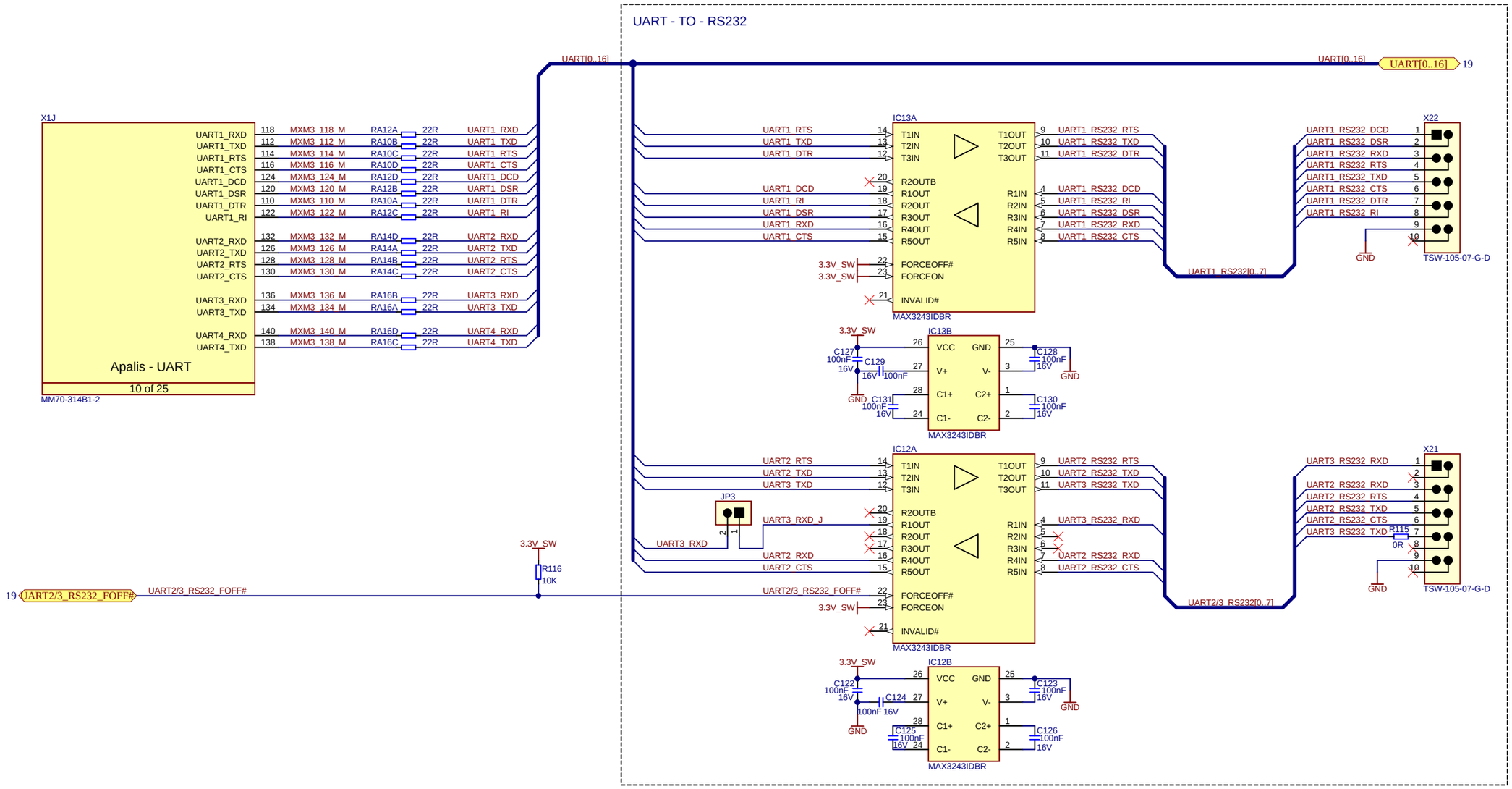
Title *Ixora*		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:15	Revision:V1.3
Date: 5/7/2023 Time: 9:23:40 PM	Sheet 15 of 20	
File: CAN.SchDoc		



Alternate parts for IC12 and IC13:
- TI, MAX3243EIDBR
- ST, ST3243EB, ST3241EBPR
- Intersil, ICL3244EIAZ-T
- Exar, ST3243E

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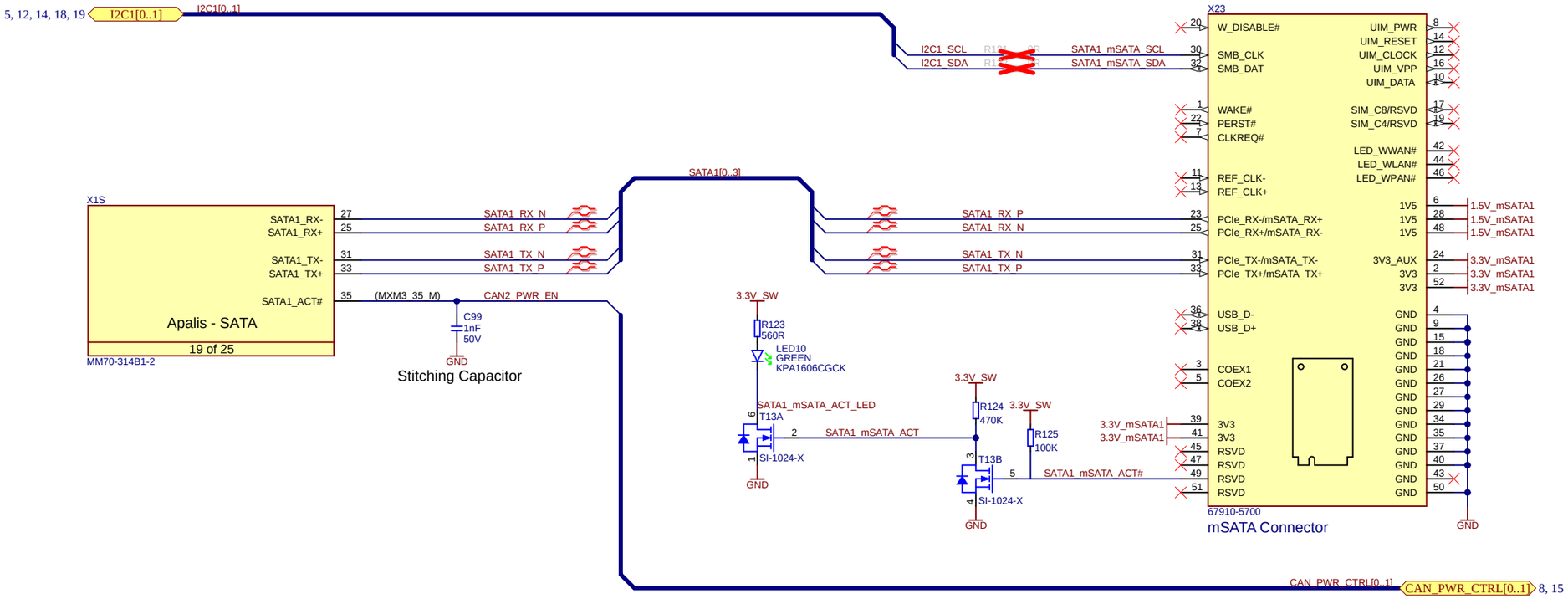
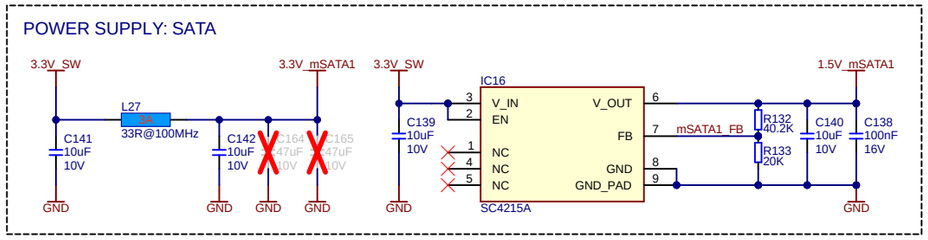
Title *Ixora*		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number: 16	Revision: V1.3
Date: 5/7/2023 Time: 9:23:40 PM	Sheet 16 of 20	
File: Serial.SchDoc		





REVISION HISTORY NOTES

NOTE 1: Mini PCIe connector schematic symbol is used in the schematic for the mSATA connector (X23), as Mini PCIe and mSATA use the same physical connector. It is important to note that the mSATA interface specifies the RX+ signal on pin 23 and RX- signal on pin 25, whereas the Mini PCIe Card features the RX+ signal on pin 25 and RX- on pin 23. The PCIe interface supports polarity reversal, but not the SATA interface.
Since the Mini PCIe connector pin names doesn't match with the mSATA signals, the situation might be confusing.
Special attention must be paid while reading or connecting the mSATA signals.

Alternate parts for X23:
- Tyco, 1775838-2

Alternate parts for IC16:
- Richtek, RT9048

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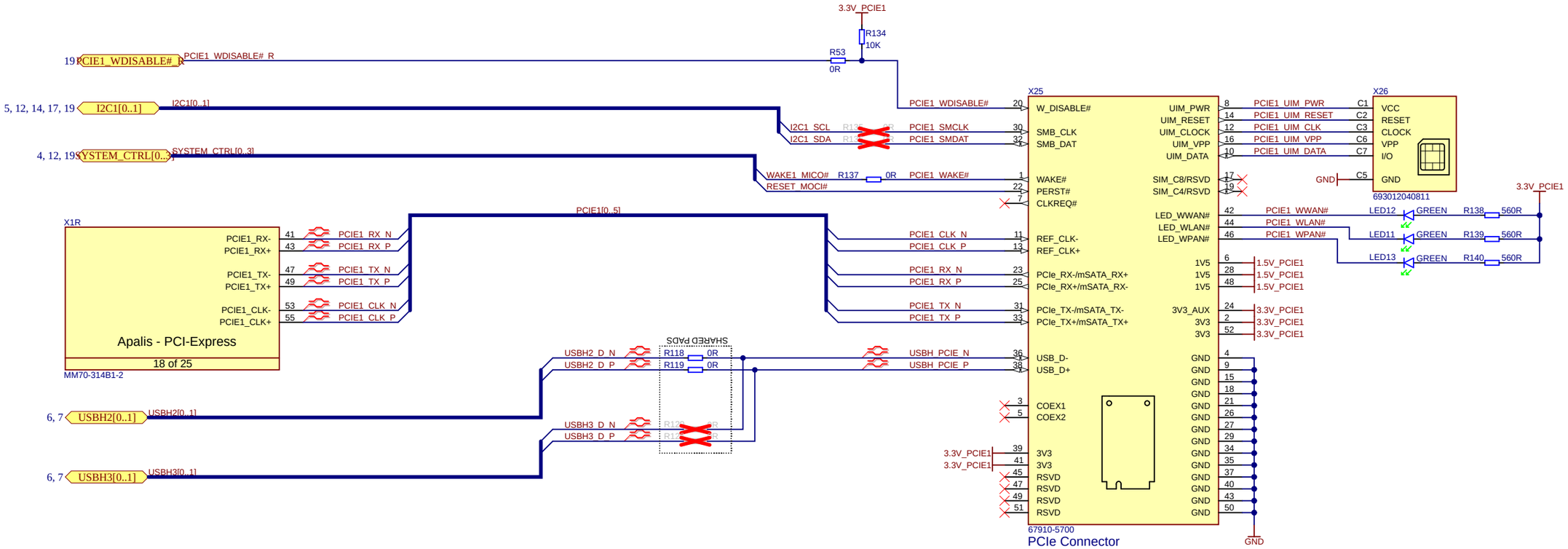
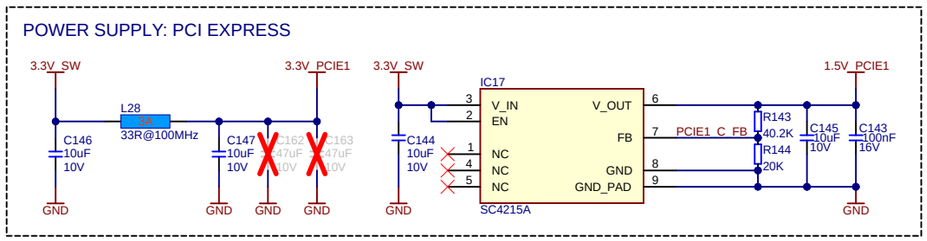
Title *Ixora*		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:17	Revision:V1.3
Date: 5/7/2023 Time: 9:23:40 PM	Sheet 17 of 20	
File: Sata.SCHDOC		





Alternate parts for X25:
- Tyco, 1775838-2

Alternate parts for IC17:
- Richtek, RT9048

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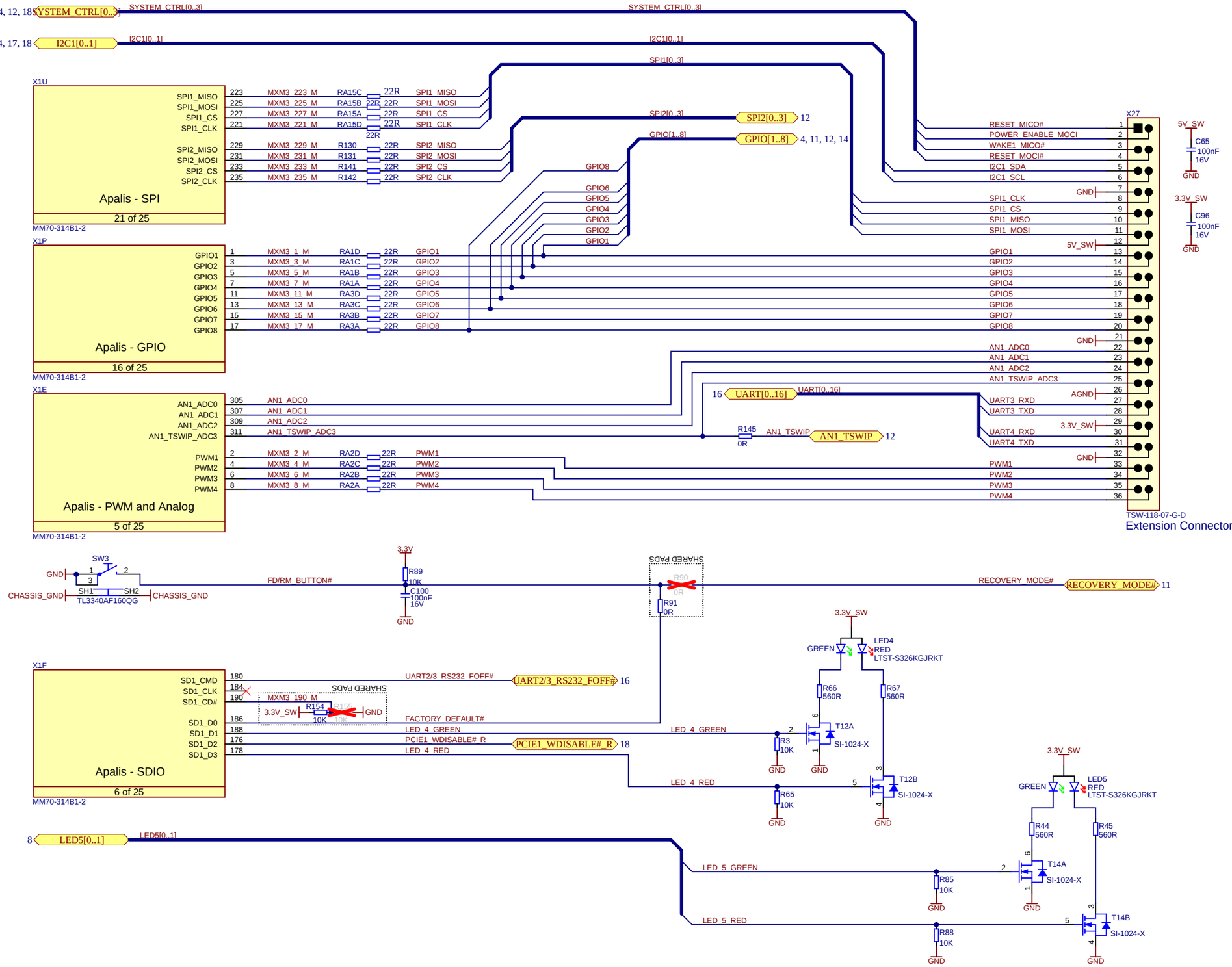
Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:18	Revision:V1.3	
Date: 5/7/2023	Time: 9:23:40 PM	Sheet 18 of 20	
File: PCI_Express.SchDoc			



Title	*Ixora*		*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:19	Revision:V1.3	
Date: 5/7/2023 Time: 9:23:41 PM	Sheet 19 of 20		
File: Extension.SchDoc			

PCB Ixora
PCB1

Fiducial
MECH9

Fiducial
MECH10

Fiducial
MECH11

Fiducial
MECH12

Fiducial
MECH17

Fiducial
MECH13

Fiducial
MECH14

Fiducial
MECH15

Fiducial
MECH16

Fiducial
MECH18

Ixora Label
MECH3


MECH22

Mini PCIe Latch
MECH1


MECH2

Mini PCIe Latch
MECH21

Mini PCIe Latch
MECH20

KFE-M3-3ET
Spacer
MECH4

KFE-M3-3ET
Spacer
MECH5

KFE-M3-3ET
Spacer
MECH6

KFE-M3-8ET
Spacer
MECH8

KFE-M3-8ET
Spacer
MECH7


JMP1


JMP2


JMP3


JMP4

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Title *Ixora*			*Toradex AG* *Ebenaustrasse 10* *Horw* *6048* *Switzerland*
Size: A3	Number:20	Revision:V1.3	
Date: 5/7/2023 Time: 9:23:41 PM		Sheet 20 of 20	
File: Mechanicals.SchDoc			