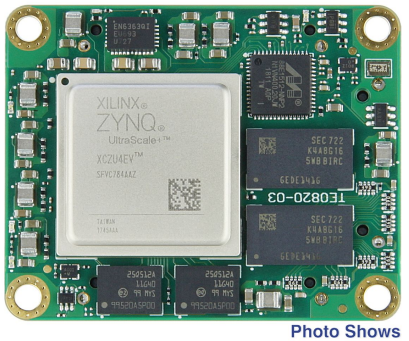
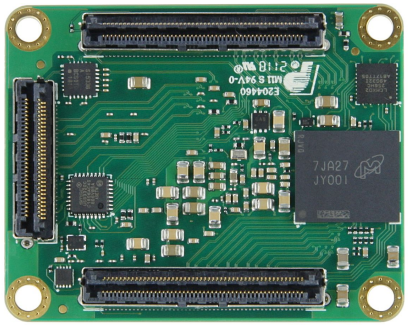




Regarding the usage of our schematics and alike documentation for Trenz module TE0820.

Project is protected under copyright and we strongly and strictly prohibit the reverse engineering or recreation, even if the design is just adapted or modified. TE0820is protected under such right and in case of plagiarism we will have to do anything necessary in order to protect our assets.

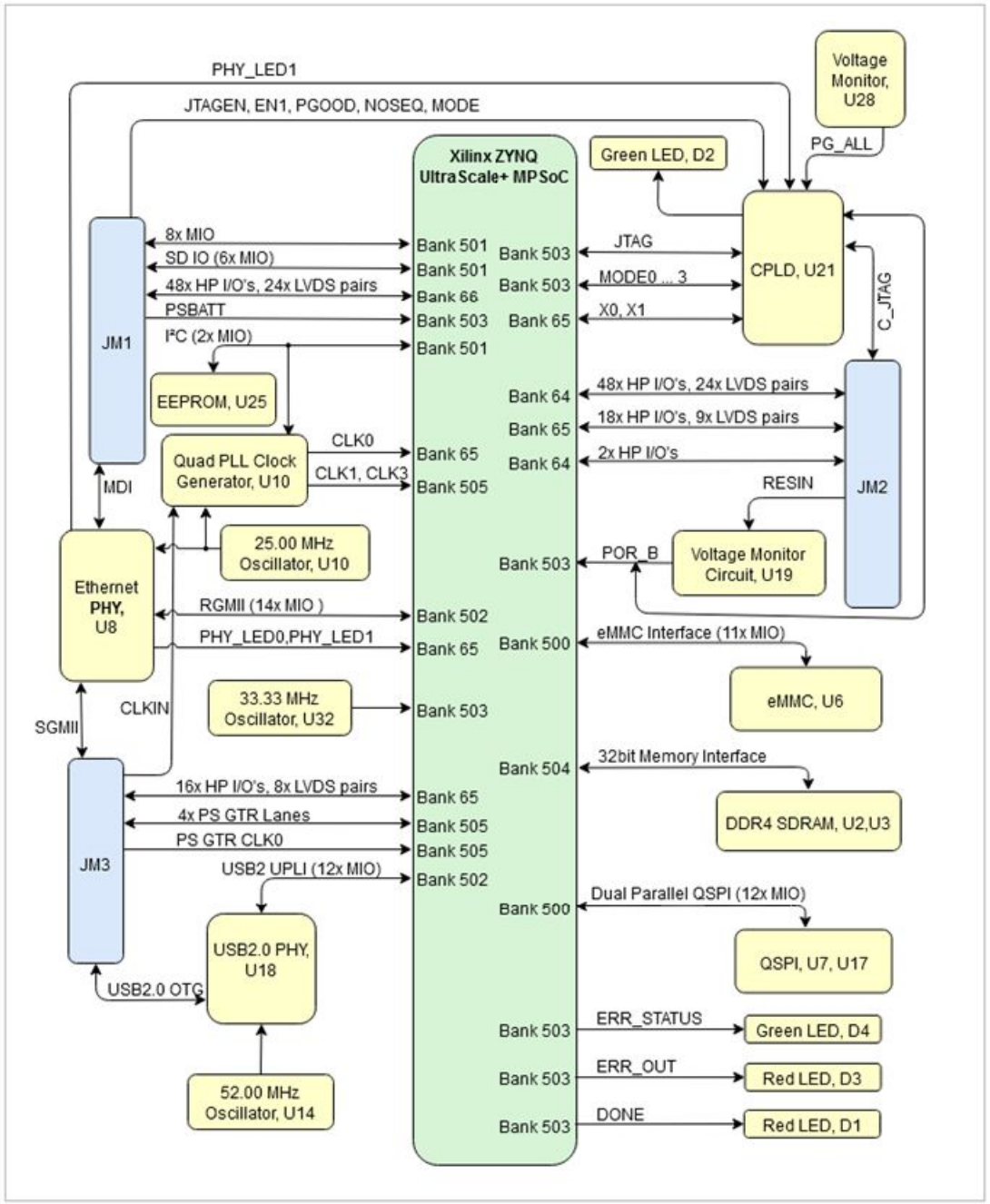
Schematics and other handouts serve for informational purposes only!

trenz electronic	Title: TE0820 - Legal Notices		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page 1 of 24
Filename: Legal Notices Modules.SchDoc			

REV	Description	
-01	Initial revision	VT
-02	1) Added MAC EEPROM (slave address:) 2) LIB components update 3) Fixed SD Card connection 4) Fixed sense connection from DCDC 5) Made correct power connection for VCU (removed DCDC, added resistors and caps like as Xilinx recommended) 6) Added resistors for variants (ZU+ with/without VCU) 7) Added termination resistors (240R) to VRP pins fro all HP-banks	VT
-03	1) Fixed VCU connection: add additional DCDC (0.9V) 2) LIB components update 3) Change package 1K resistors (0402 -> 0201) 4) Added LEDs (1x user LED, 1x LED for ERR_STATUS, 1xLED for ERR_OUT) 5) Change obsolete 2xSPI Flash (256MBit) -> 2xSPI Flash (512MBit) 6) Added additional DCDCs (PL_VCCINT_IO, PS_FP0V85) 7) Changed DCDC (U5) 6A (optional 4A)	VT
-04	1) Fixed DDR4 connection (BG1), support B-die DDR4 Industrial grade chips 2) Added R93, changed value C62, change obsolete U28 3) Added R89 (10R) 4) Added additional caps 4.7uF to PS_AVTT/PS_AVCC (Xilinx doc UG583) 5) Changed R51 20k ->10K (PS_AVCC = 0.85V, Xilinx doc DS925 v1.17) 6) Fixed DDR4 connection (Alert) 7) Added 3.3V signal to CPLD 8) Added testpoints 9) LIB components update	VT
-04A	1) Added block diagram, updated module pictures	VY
-05	1) Changed EOL Ferrite Beads L1..5,L7,L9..12 2) Changed EOL DCDC U5 (EN6363QI -> MPM3860GQW-Z) 3) Changed EOL Load Switch U28 (TPS27082LDDCR -> MP5077GG-Z) 4) Added additional Decoupling Capacitors and changed caps 4.7uF to 10uF (Xilinx doc UG583 v1.23) 5) Added pull-down and testpoint to TEN DDR4 signal 6) Changed EOL Transistor T1 (AO7800 -> BSD840NH6327XTSA1) 7) Added Voltage Detector U30 (BD39040MUF-CE2) 8) Changed EOL eMMC U6 (MTFC4GACAJCN-4M -> SDINBDG4-8G-XI2) 9) Changed EOL MEMS U14 (SiT8008AI-73-XXS-52.000000E -> SiT8008BI-73-XXS-52.000000E) 10) Added signal PG_ALL (U30) to CPLD (pin5) 11) Added option (depends assembly variants, for all assembly variants R128 set as populated, instead special inquiry) signal POR_B through R128, T2 to CPLD (pin27) 12) Added option (depends assembly variants, for all assembly variants R95 set as DNP, instead special inquiry) signal EN1 through R95 to DCDC U5 13) Added option (depends assembly variants, for all assembly variants U29 and R129 set as populated, instead special inquiry) signal PHY_LED1 through Level Translator U29 to FPGA (U1.K7) 14) Added Resistors R130 & R131 (select Power-on delay override, for all assembly variants R130 set as DNP -> Standard PL Power-on delay time) 15) Added Diode D5 16) Added Power Diagram Sheet 17) LIB components update	VT

trenz electronic

Title: TE0820 - Revision Changes		
A4	Number: TE0820 3AE21MA	Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH	Page2 of 24
Filename: Revision Changes.SchDoc		

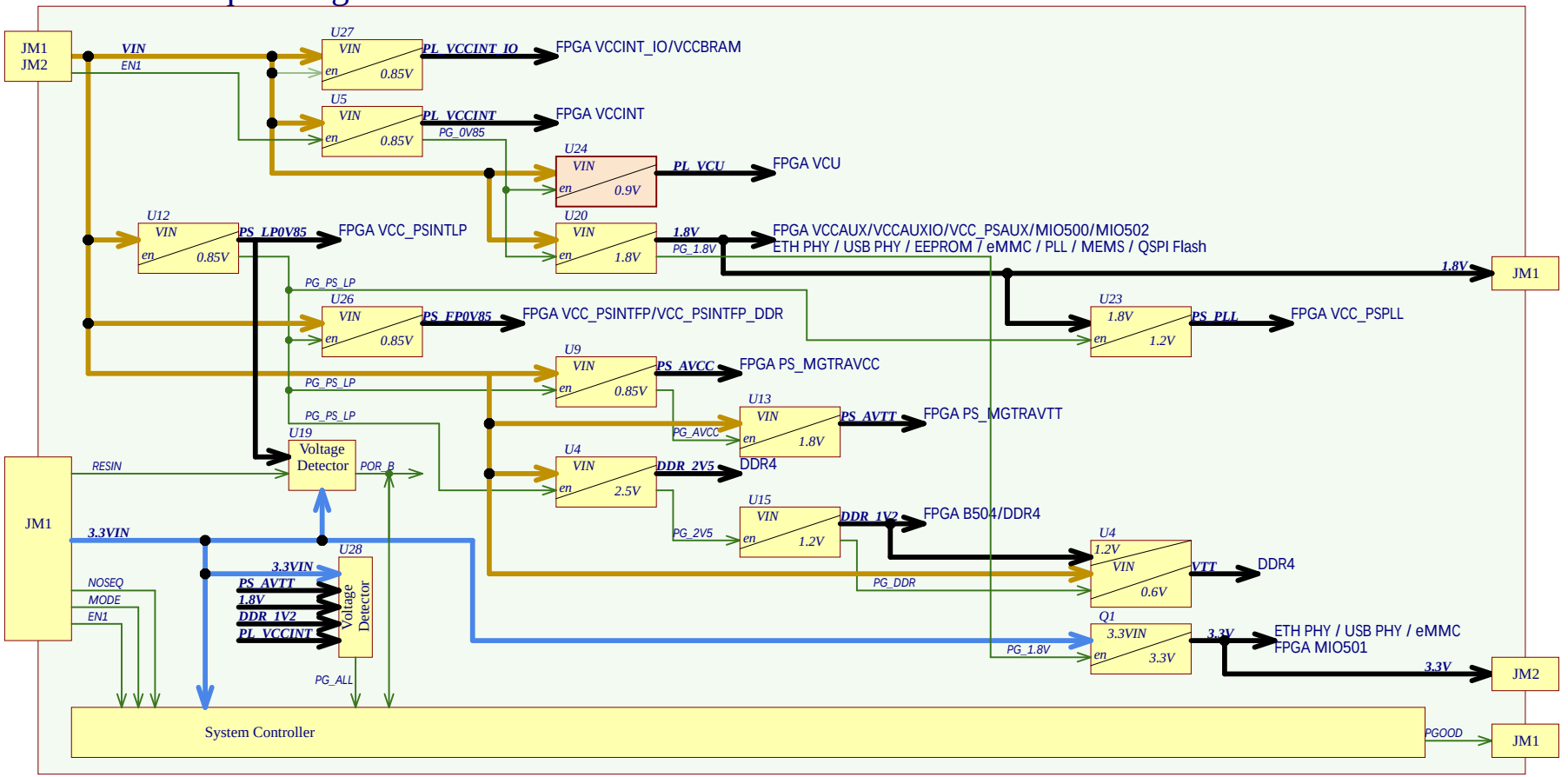


TE0820 List of Web Documentation

Web Document Name	Link	QR-code
TE0820 Resources	URL	
TE0820 TRM	URL	
TE0820 Reference Designs	URL	
TE0820 CPLD Firmware	URL	
TE0820 Product Change Notifications	URL	
TE0820 Design and Advisory Notes	URL	

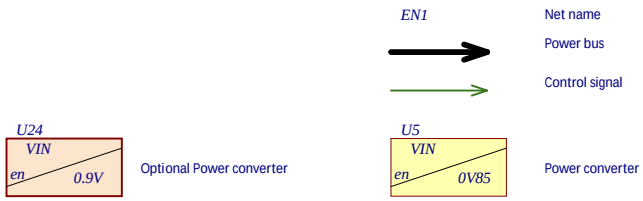
Title: TE0820 - System Overview		
A4	Number: TE0820 3AE21MA	Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH	Page 3 of 24
Filename: Overview.SchDoc		

Power-on sequencing:



Supported Voltage Ranges:

Power Rail	Direction	Range	Tolerance	Description	Note
VIN	IN	3.3 - 5V	+/-5%	Micromodule Power	-
3.3VIN	IN	3.3V	+/-5%	Micromodule Power	-
VCCO64	IN	1.2 - 1.8V	+/-3%	HP IO Bank64	-
VCCO65	IN	1.2 - 1.8V	+/-3%	HP IO Bank65	-
VCCO66	IN	1.2 - 1.8V	+/-3%	HP IO Bank66	-
PSBATT	IN	1.2 - 1.5V	+/-3%	PS battery-backed RAM and battery RTC	-
1.8V	OUT	1.8V	+/-3%	Power for Carrier	-
3.3V	OUT	3.3V	+/-3%	Power for Carrier	-



trenz electronic

Title: TE0820 - Power Diagram		
A4	Number: TE0820 3AE21MA	Rev. 05
Date: 30.06.2022	Copyright: Trenz Electronic GmbH	Page 4 of 24
Filename: Power_Diagram.SchDoc		

U_USB-PHY
USB-PHY.SchDoc

U_ETH-PHY
ETH-PHY.SchDoc

U_B_HD
B_HD.SchDoc

U_B64
B64.SchDoc

U_B65
B65.SchDoc

U_B66
B66.SchDoc

U_CONFIG
CONFIG.SchDoc

U_B_MIO
B_MIO.SchDoc

U_B_PS_GT
B_PS_GT.SchDoc

U_CLK
CLK.SchDoc

U_B2B-Connectors
B2B-Connectors.SchDoc

U_eMMC
eMMC.SchDoc

U_PS_DDR
PS_DDR.SchDoc

U_ZU_POWER
ZU_POWER.SchDoc

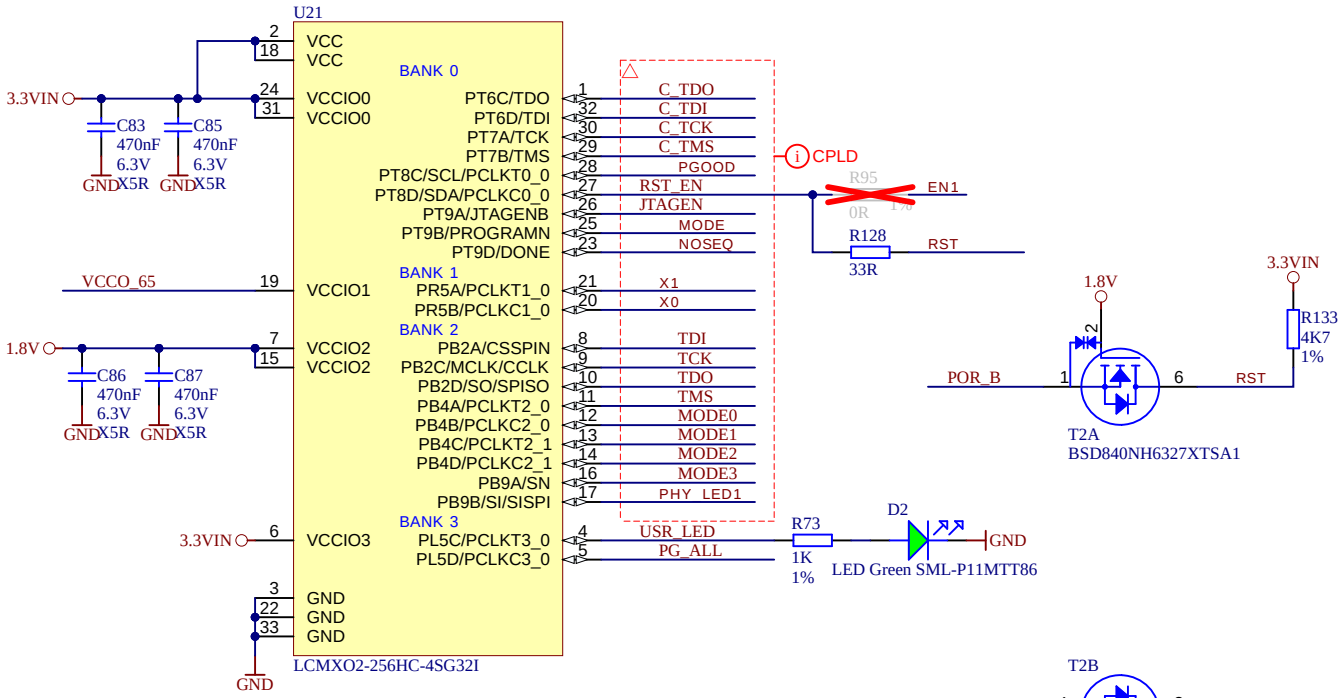
U_ZU_PS_POWER
ZU_PS_POWER.SchDoc

U_DDR4-RAM_2
DDR4-RAM_2.SchDoc

U_DDR4-RAM
DDR4-RAM.SchDoc

U_POWER
POWER.SchDoc

U_POWER_1
POWER_1.SchDoc

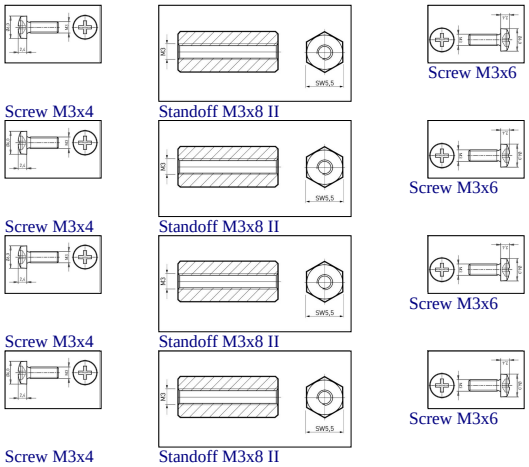


Special notes:

Serial
Serial
Serialnumber 6,3 x 6.3mm

PM1
FIDU-DOT - mini
PM2
FIDU-DOT - mini
PM3
FIDU-DOT - mini
PM4
FIDU-DOT - mini
PM5
FIDU-DOT - mini
PM6
FIDU-DOT - mini

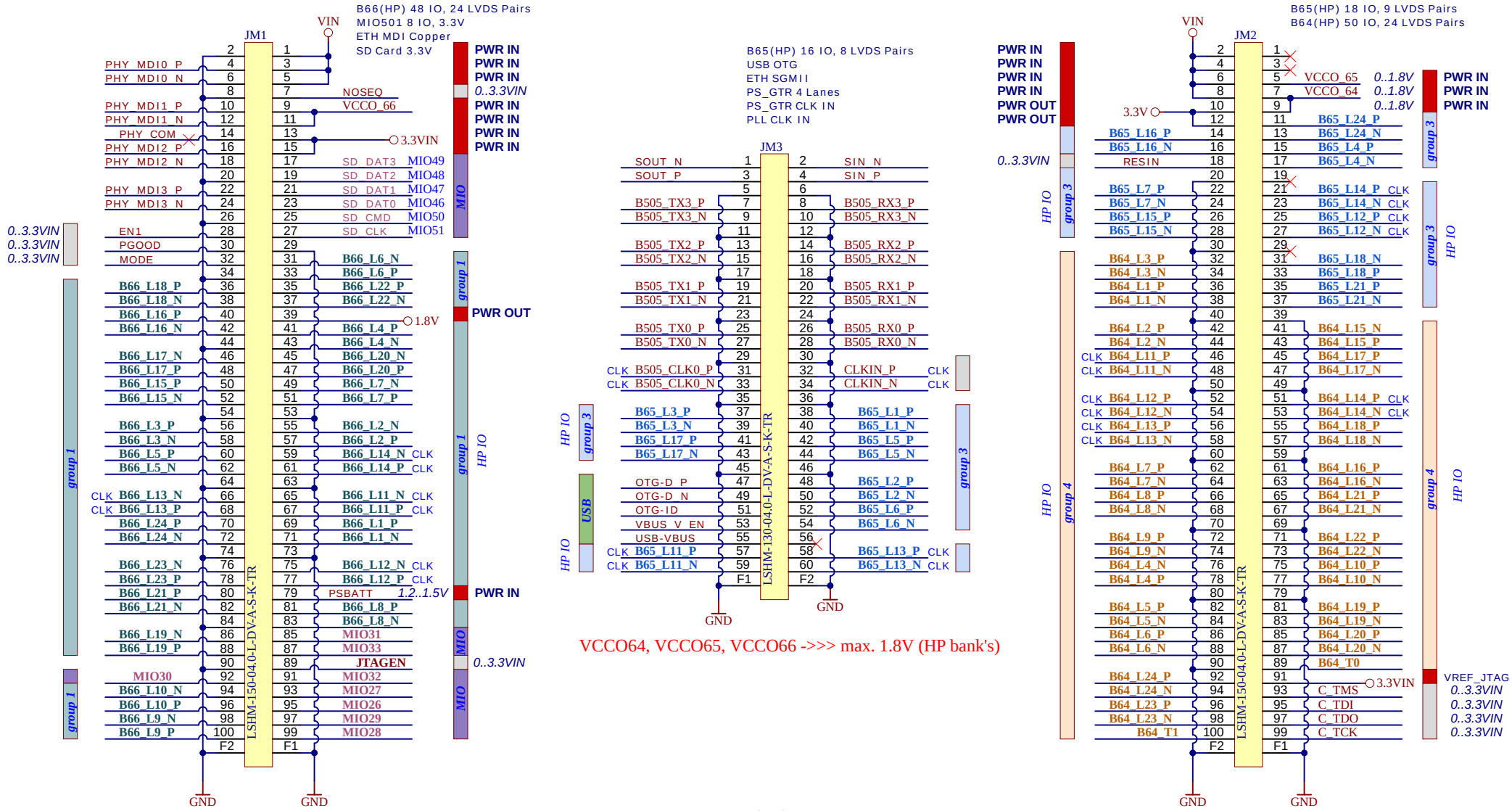
Mount.Hole 3.2mm
GND
Mount.Hole 3.2mm
GND
Mount.Hole 3.2mm
GND
Mount.Hole 3.2mm
GND

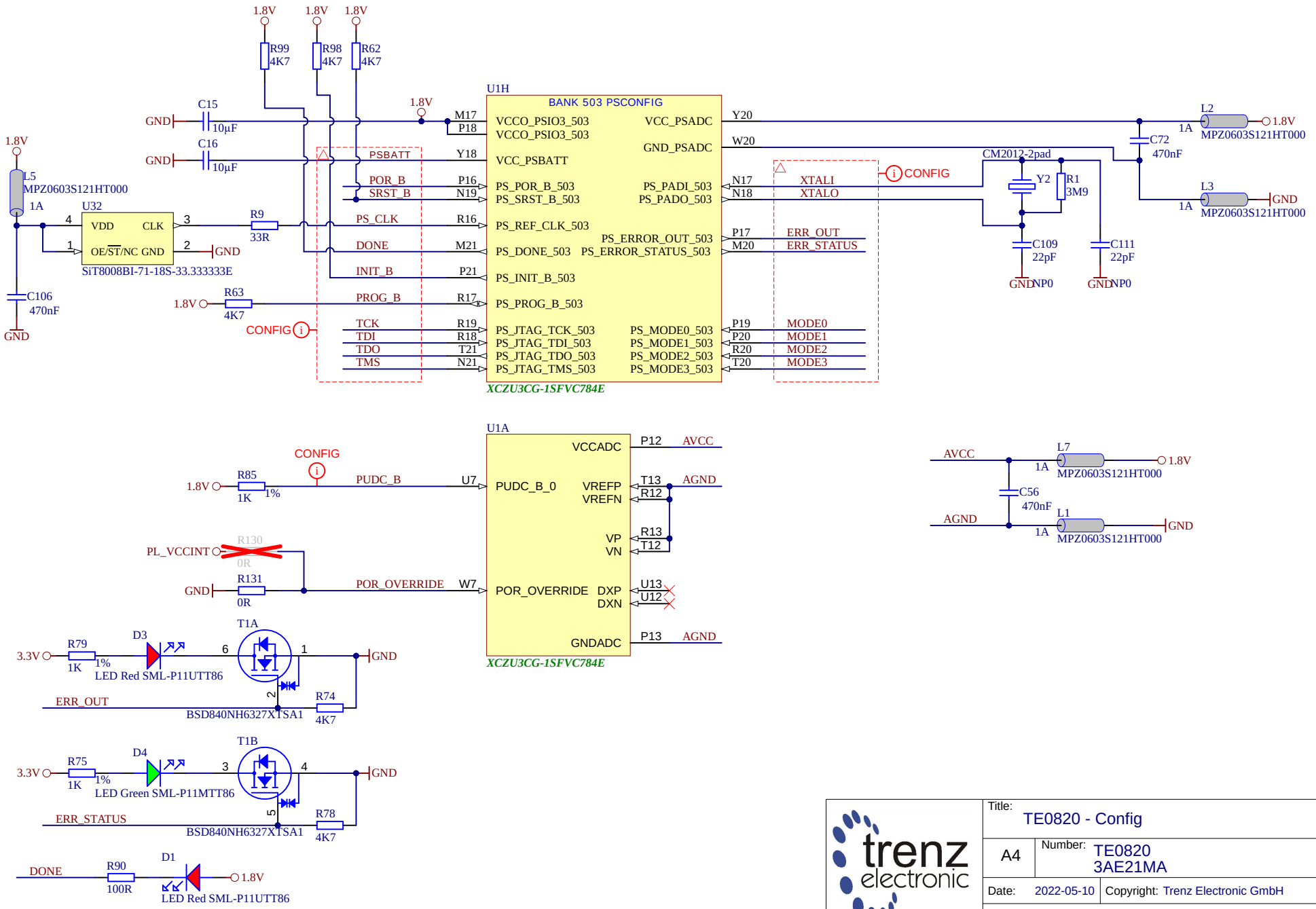


Assembly variant	3AE21MA
Created by	RM
Modified by	VT
Modified at	2022-05-31
SVN Revision	13497

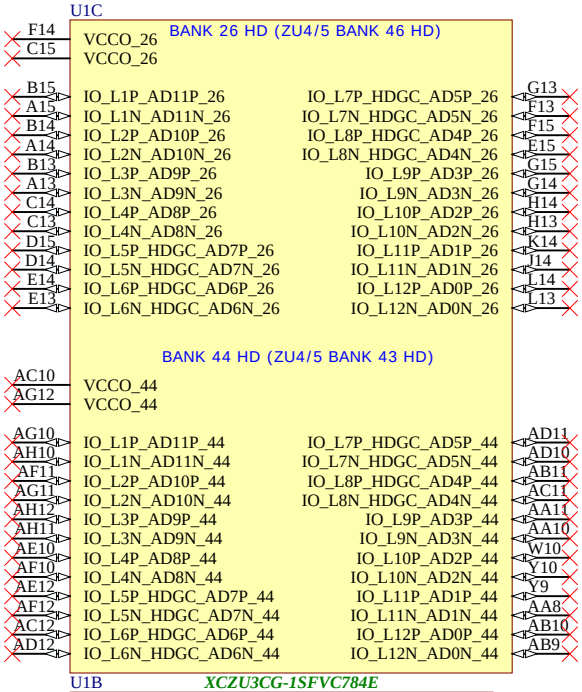
trenz electronic

Title: TE0820		
A4	Number: TE0820 3AE21MA	Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH	Page5 of 24
Filename: TE0820.SchDoc		

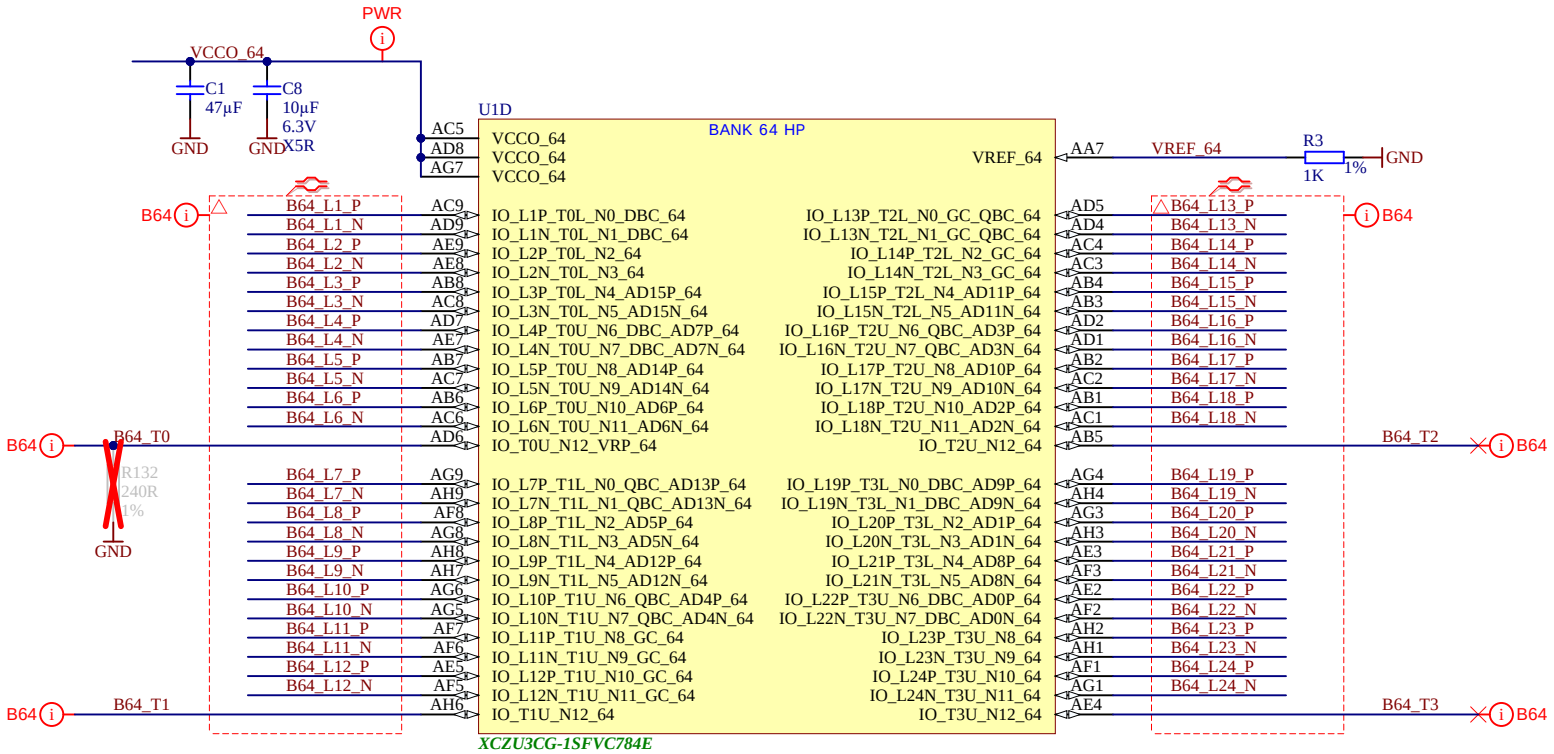

B66(HP) 48 IO, 24 LVDS Pairs
MIO501 8 IO, 3.3V
ETH MDI Copper
SD Card 3.3V
JM1
VIN
LSHM-150-04.0-L-DV-A-S-K-TR
PHY_MDI0_P
PHY_MDI0_N
PHY_MDI1_P
PHY_MDI1_N
PHY_COM
PHY_MDI2_P
PHY_MDI2_N
PHY_MDI3_P
PHY_MDI3_N
EN1
PGOOD
MODE
NOSEQ
VCCO_66
3.3VIN
SD_DAT3 MIO49
SD_DAT2 MIO48
SD_DAT1 MIO47
SD_DAT0 MIO46
SD_CMD MIO50
SD_CLK MIO51
1.8V
PSBATT 1.2..1.5V
JTAGEN
MIO30
MIO31
MIO32
MIO33
MIO26
MIO27
MIO28
MIO29
PWR IN
PWR OUT
MIO
group 1
HP IO
0..3.3VIN
GND
B65(HP) 16 IO, 8 LVDS Pairs
USB OTG
ETH SGMII
PS_GTR 4 Lanes
PS_GTR CLK IN
PLL CLK IN
JM3
SOUT_N
SOUT_P
SIN_N
SIN_P
B505_TX3_P
B505_TX3_N
B505_RX3_P
B505_RX3_N
B505_TX2_P
B505_TX2_N
B505_RX2_P
B505_RX2_N
B505_TX1_P
B505_TX1_N
B505_RX1_P
B505_RX1_N
B505_TX0_P
B505_TX0_N
B505_RX0_P
B505_RX0_N
B505_CLK0_P
B505_CLK0_N
CLKIN_P
CLKIN_N
OTG-D_P
OTG-D_N
OTG-ID
VBUS_V_EN
USB-VBUS
USB
group 3
VCCO64, VCCO65, VCCO66 ->>> max. 1.8V (HP bank's)
B65(HP) 18 IO, 9 LVDS Pairs
B64(HP) 50 IO, 24 LVDS Pairs
JM2
VCCO_65 0..1.8V
VCCO_64 0..1.8V
0..1.8V
B65_L24_P
B65_L24_N
B65_L16_P
B65_L16_N
B65_L4_P
B65_L4_N
RESIN
B65_L7_P
B65_L7_N
B65_L15_P
B65_L15_N
B65_L14_P CLK
B65_L14_N CLK
B65_L12_P CLK
B65_L12_N CLK
B65_L18_N
B65_L18_P
B65_L21_P
B65_L21_N
B64_L3_P
B64_L3_N
B64_L1_P
B64_L1_N
B64_L2_P
B64_L2_N
B64_L15_N
B64_L15_P
B64_L11_P CLK
B64_L11_N CLK
B64_L17_P
B64_L17_N
B64_L12_P CLK
B64_L12_N CLK
B64_L14_P CLK
B64_L14_N CLK
B64_L13_P CLK
B64_L13_N CLK
B64_L18_P
B64_L18_N
B64_L7_P
B64_L7_N
B64_L8_P
B64_L8_N
B64_L16_P
B64_L16_N
B64_L21_P
B64_L21_N
B64_L9_P
B64_L9_N
B64_L4_N
B64_L4_P
B64_L22_P
B64_L22_N
B64_L10_P
B64_L10_N
B64_L5_P
B64_L5_N
B64_L6_P
B64_L6_N
B64_L19_P
B64_L19_N
B64_L20_P
B64_L20_N
B64_T0
B64_L24_P
B64_L24_N
B64_L23_P
B64_L23_N
B64_T1
C_TMS
C_TDI
C_TDO
C_TCK
VREF_JTAG
group 4
MIO[29..26] ->PJTAG1
VCCO_64 0..1.8V
VCCO_65 0..1.8V
VCCO_66 0..1.8V
MIO 0..3.3V
group 1 0..VCCO_66
group 3 0..VCCO_65
group 4 0..VCCO_64
trenz electronic
Title: TE0820 - B2B Connectors
A4
Number: TE0820 3AE21MA
Rev. 05
Date: 2022-05-10
Copyright: Trenz Electronic GmbH
Page6 of 24
Filename: B2B-Connectors.SchDoc



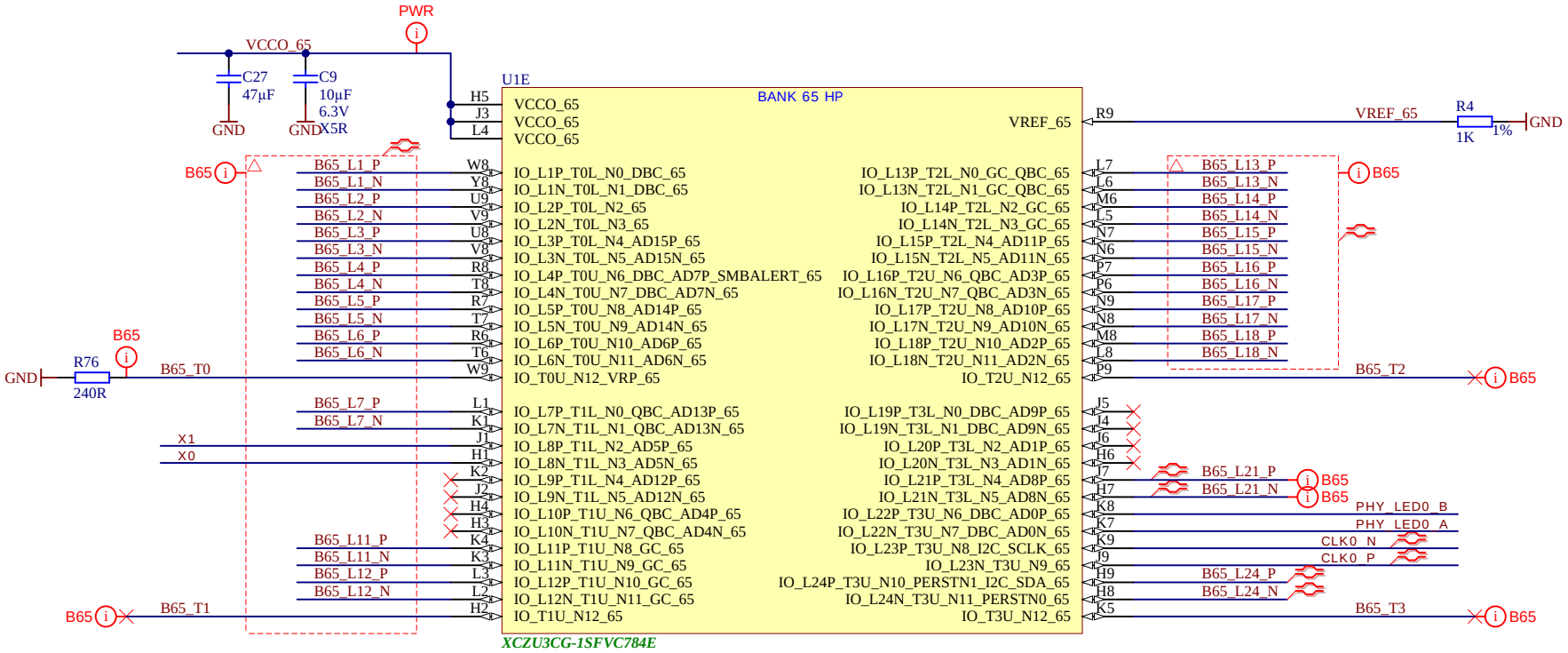
trenz electronic	Title: TE0820 - Config		
	A4	Number: TE0820 3AE21MA	Rev. 05
	Date: 2022-05-10	Copyright: Trenz Electronic GmbH	Page7 of 24
	Filename: CONFIG.SchDoc		



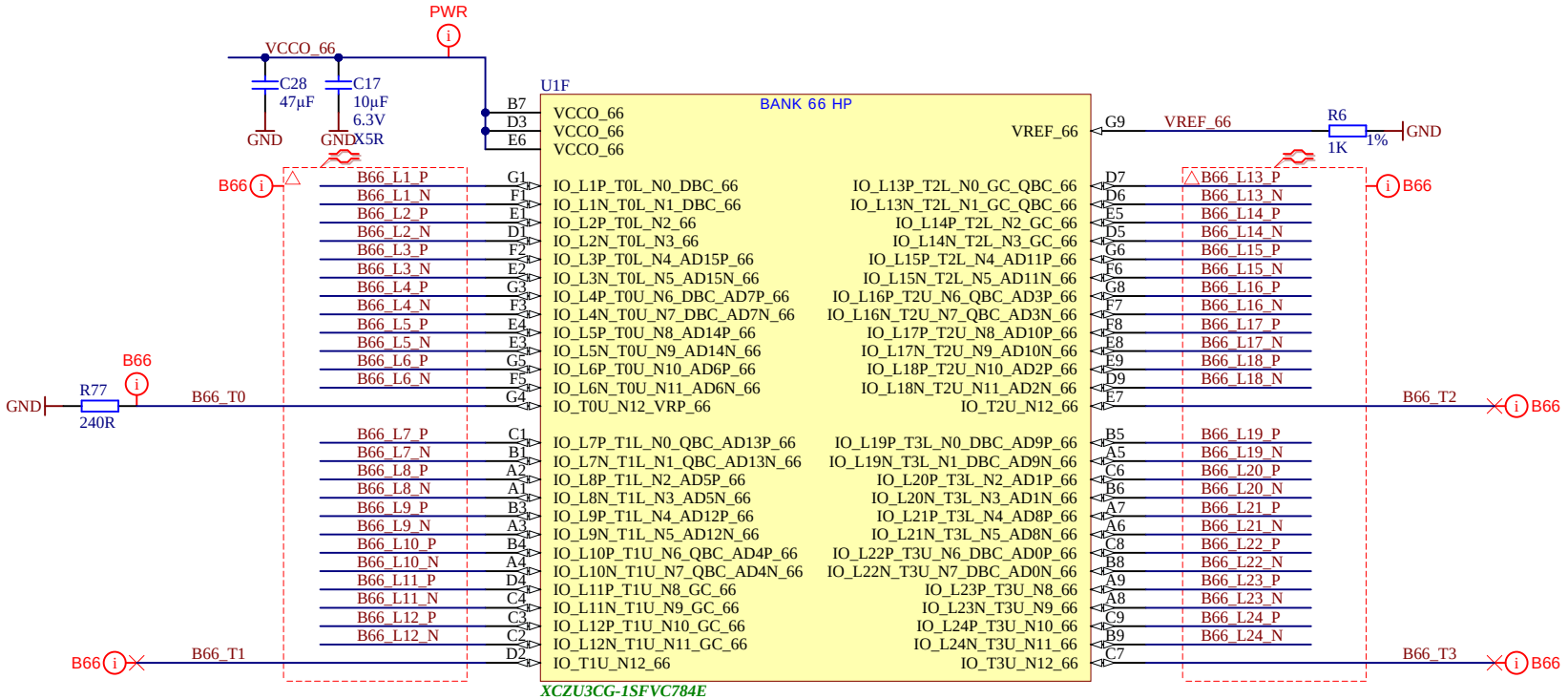
trenz electronic	Title: TE0820 - HD Banks		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page8 of 24
Filename: B_HD.SchDoc			



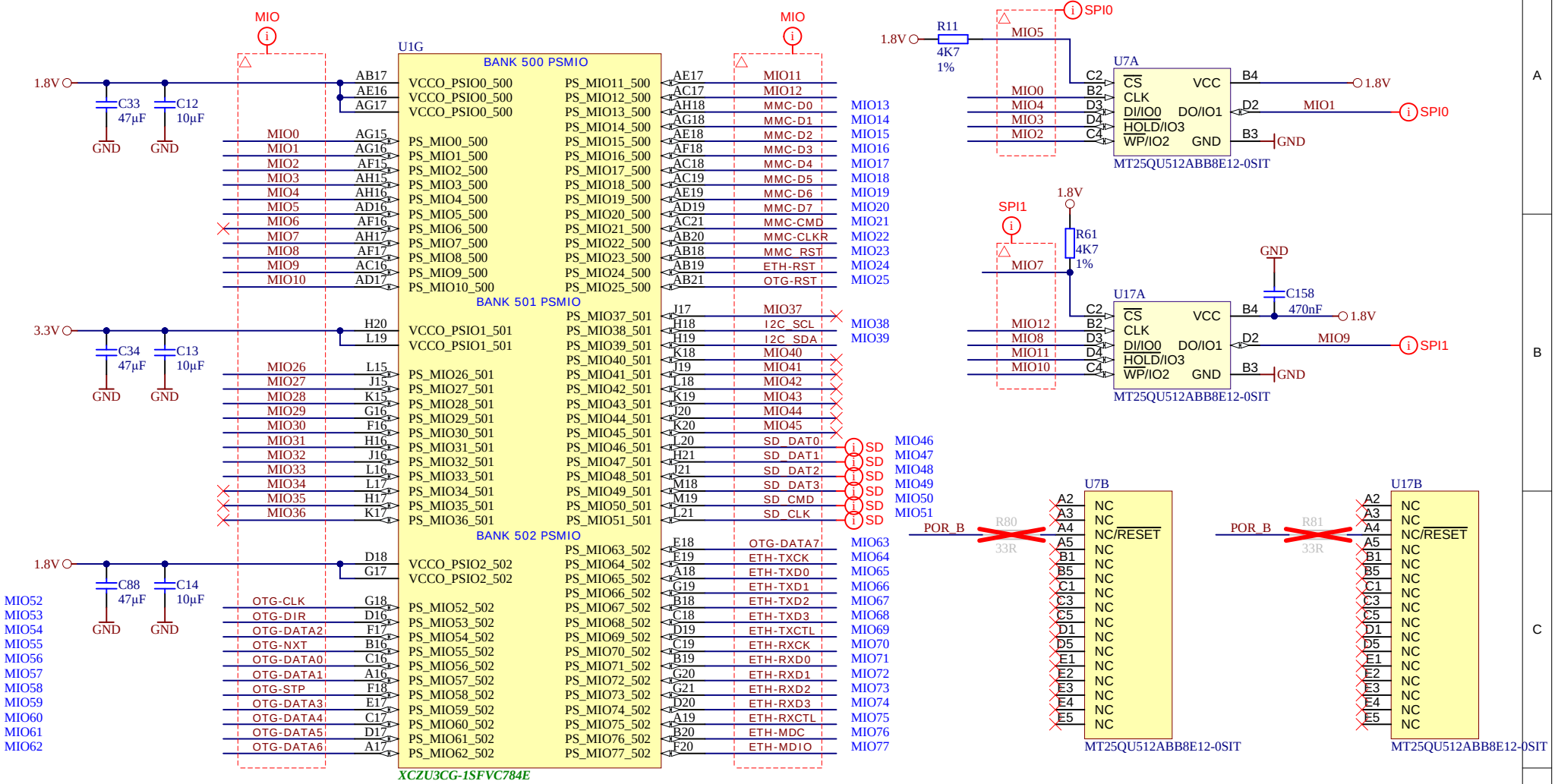
Title: TE0820 - B64			
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page9 of 24
Filename: B64.SchDoc			

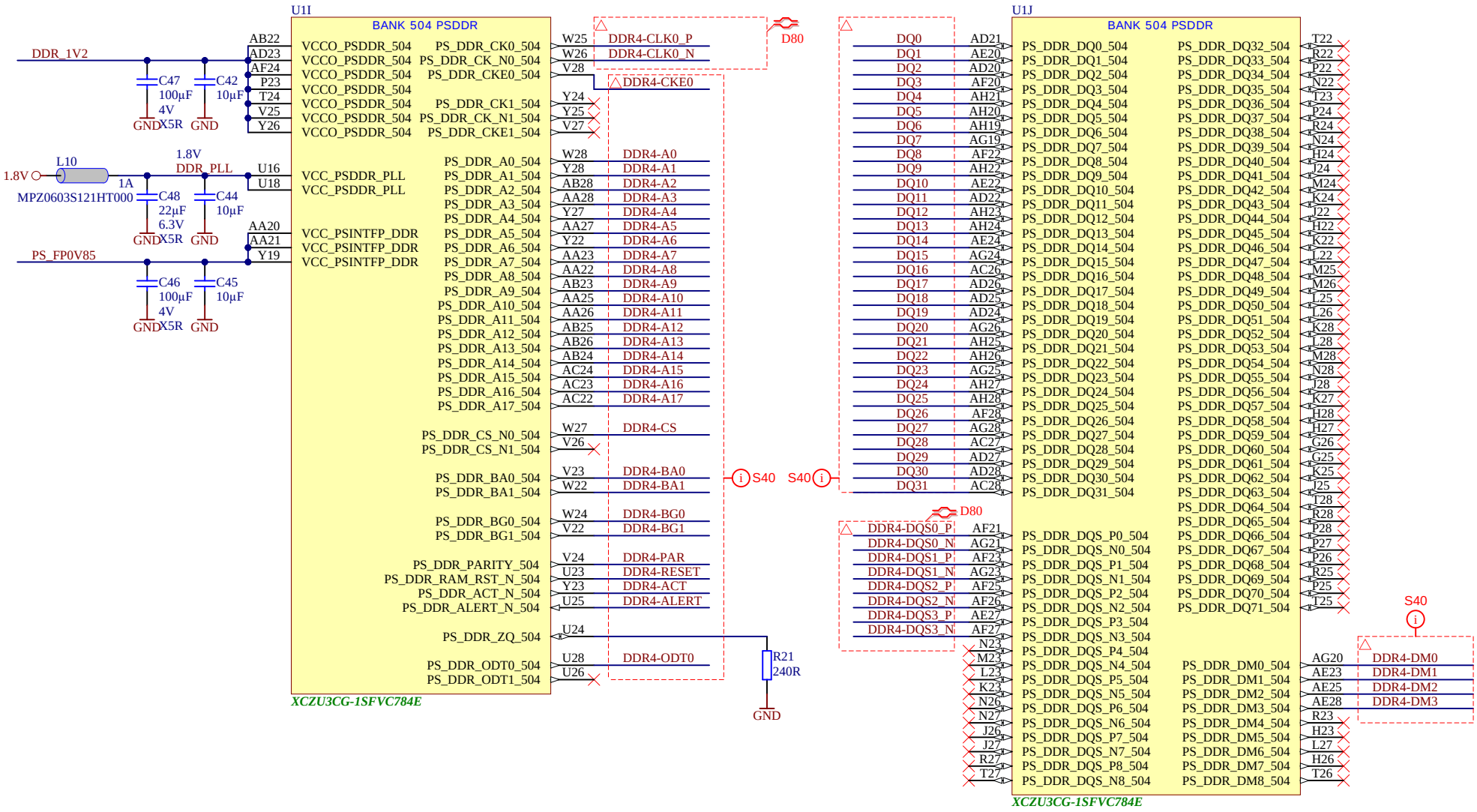


trenz electronic	Title: TE0820 - B65		
	A4	Number: TE0820 3AE21MA	Rev. 05
	Date: 2022-05-10	Copyright: Trenz Electronic GmbH	Page10 of 24
	Filename: B65.SchDoc		

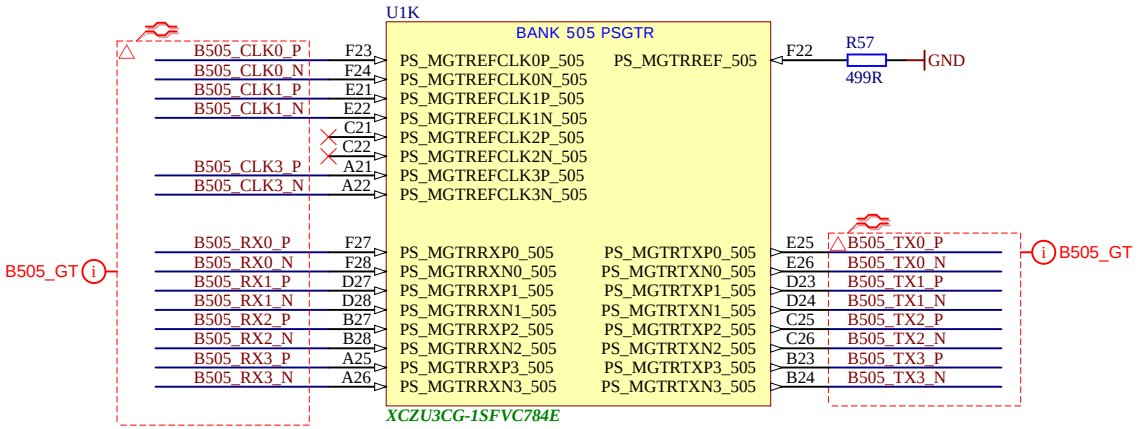


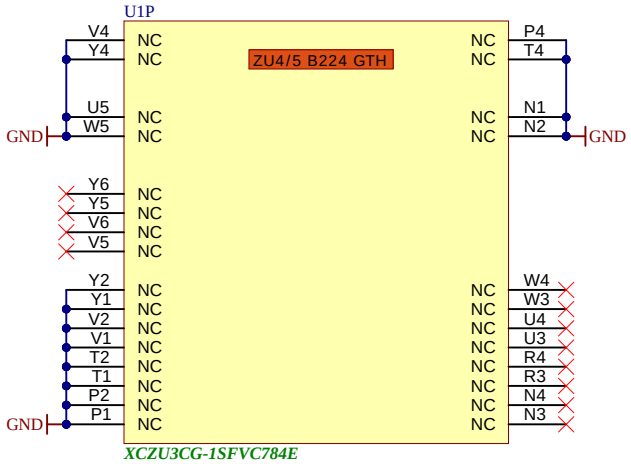
trenz electronic	Title: TE0820 - B66		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page11 of 24
Filename: B66.SchDoc			


MIO
U1G
BANK 500 PSMIO
BANK 501 PSMIO
BANK 502 PSMIO
XCZU3CG-1SFVC784E
1.8V
3.3V
C33 47µF
C12 10µF
C34 47µF
C13 10µF
C88 47µF
C14 10µF
GND
SPI0
SPI1
R11 4K7 1%
R61 4K7 1%
U7A
U17A
MT25QU512ABB8E12-0SIT
C158 470nF
R80 33R
R81 33R
POR_B
U7B
U17B
NC/RESET
Title: TE0820 - MIO Banks
A4
Number: TE0820 3AE21MA
Rev. 05
Date: 2022-05-10
Copyright: Trenz Electronic GmbH
Page12 of 24
Filename: B_MIO.SchDoc
trenz electronic

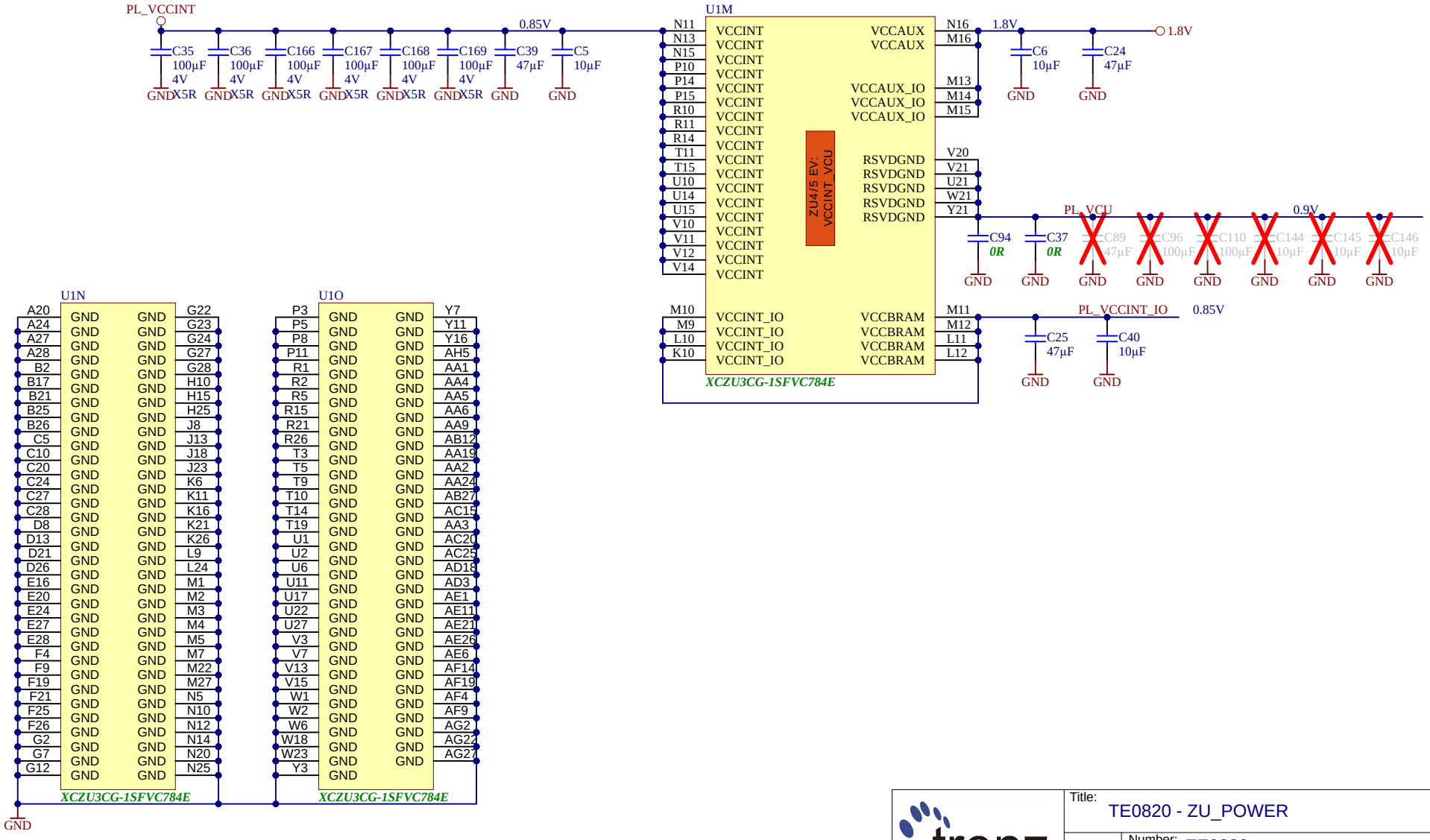


Title: TE0820 - PS_DDR			
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page13 of 24
Filename: PS_DDR.SchDoc			

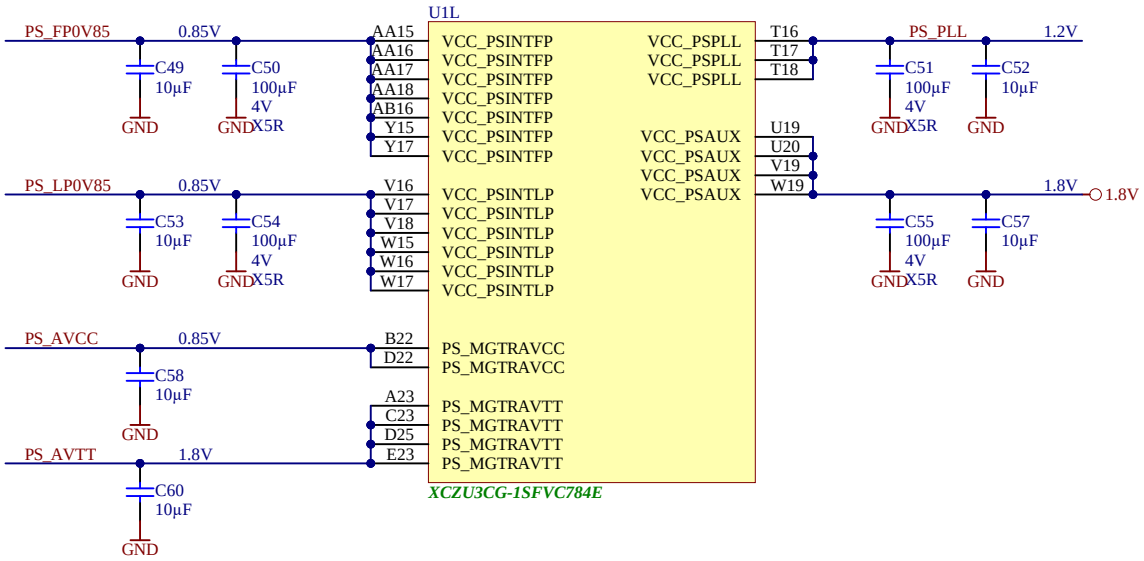




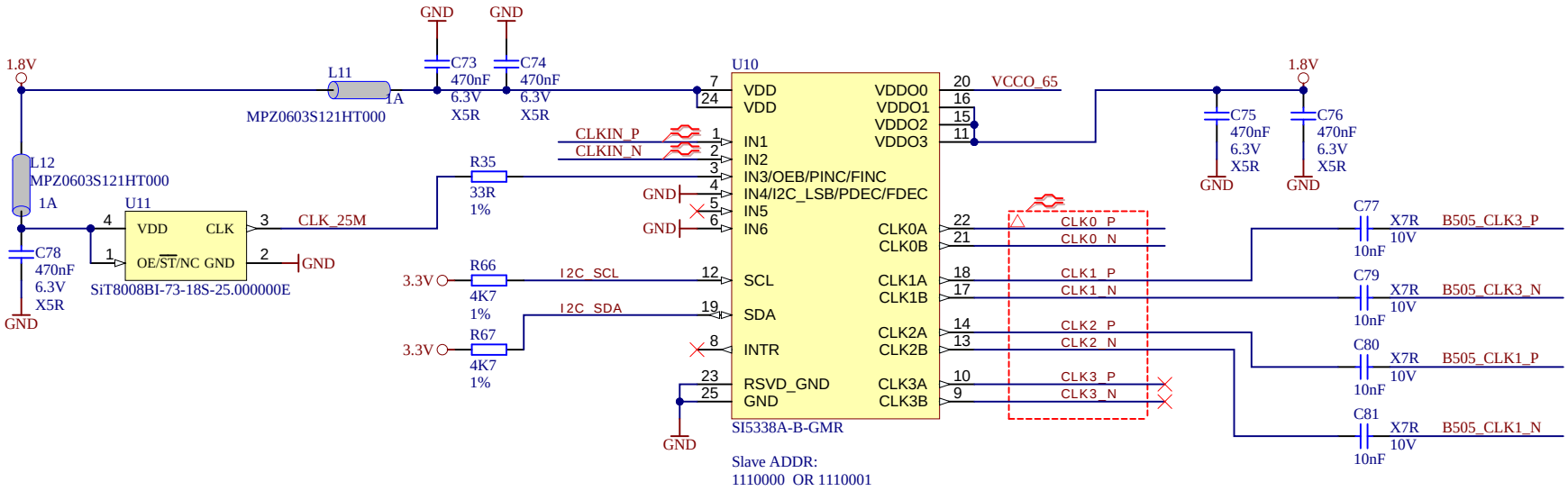
trenz electronic	Title: TE0820 - PS_GT		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page14 of 24
Filename: B_PS_GT.SchDoc			



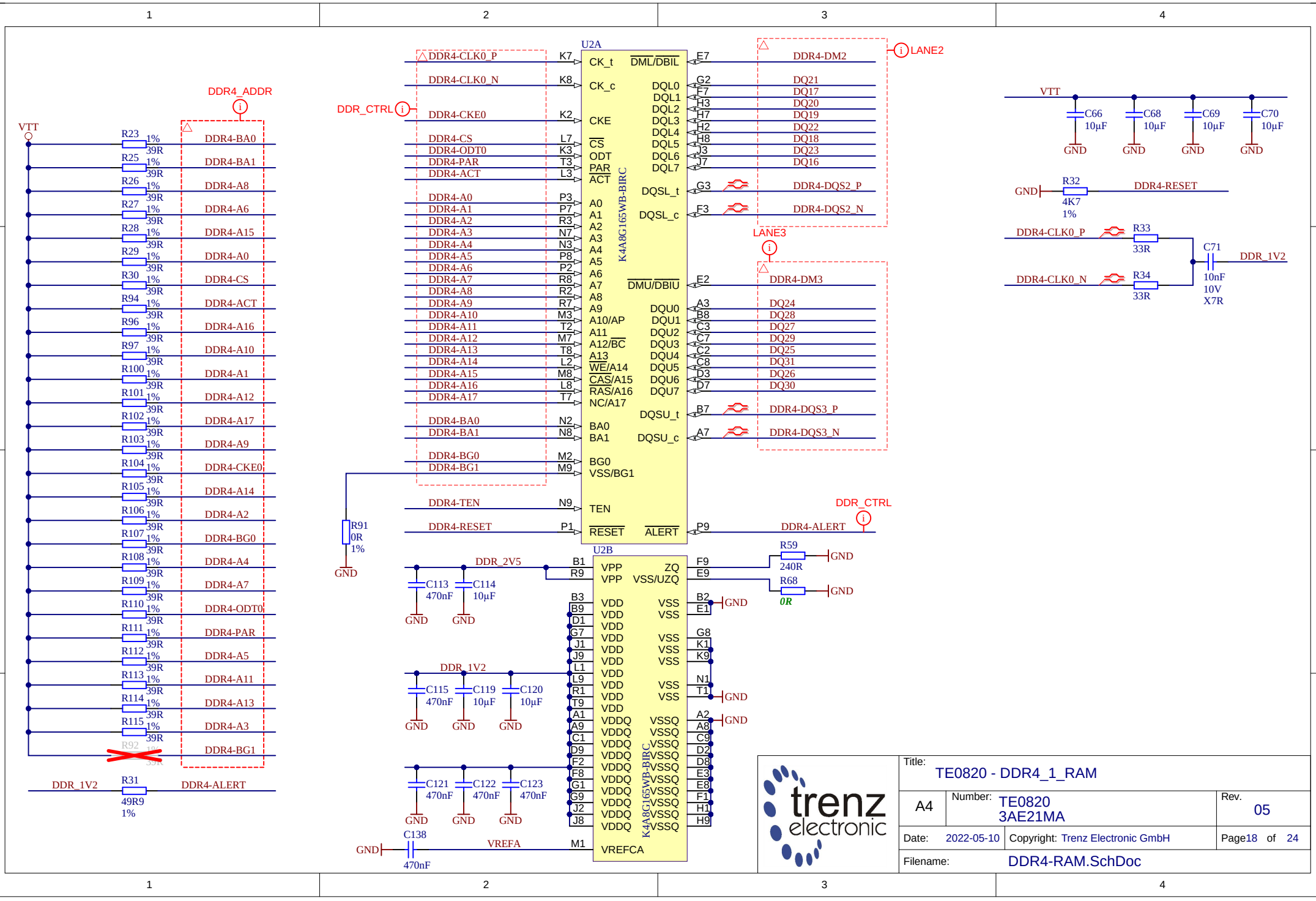
Title: TE0820 - ZU_POWER		
A4	Number: TE0820 3AE21MA	Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH	Page15 of 24
Filename: ZU_POWER.SchDoc		

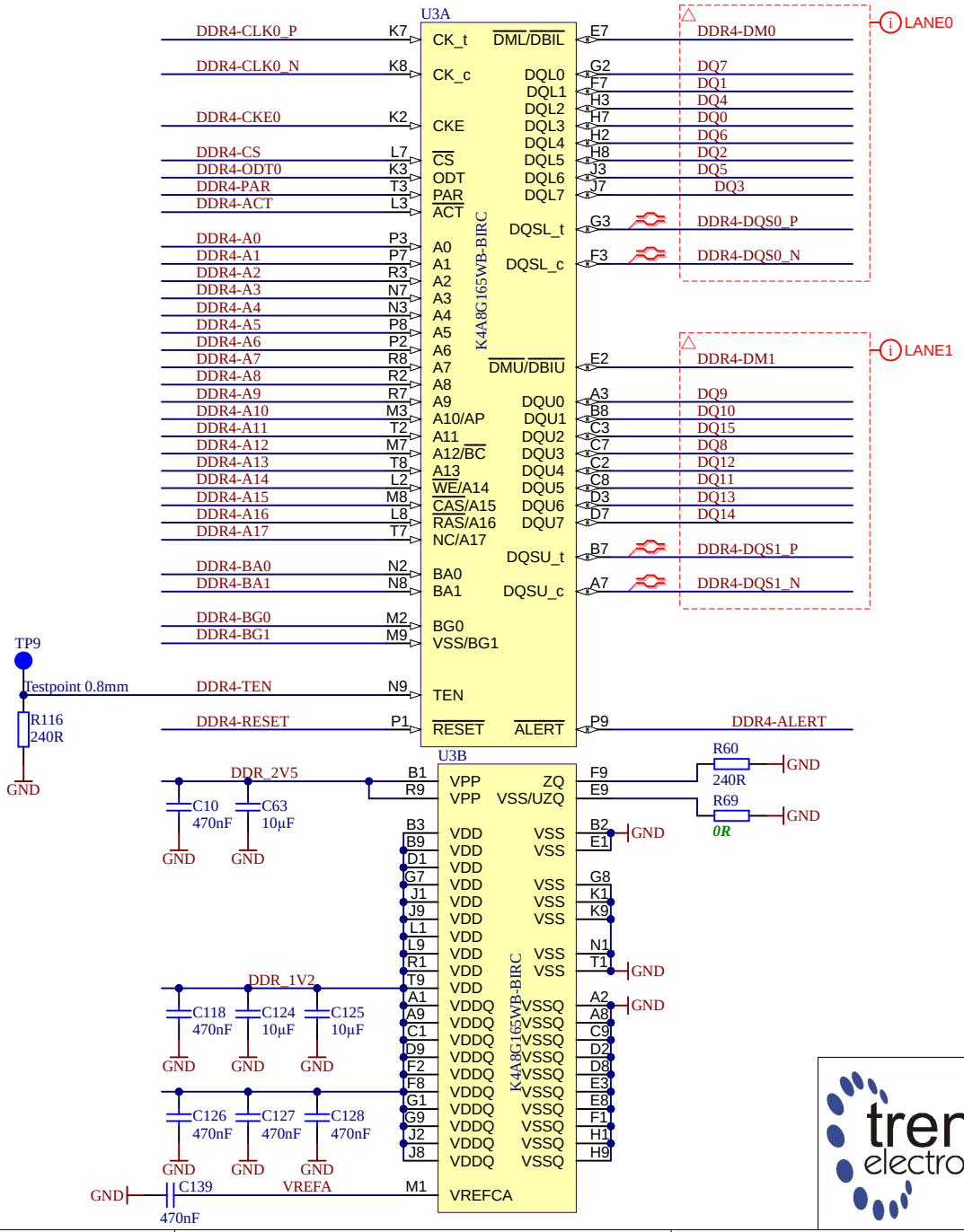


trenz electronic	Title: TE0820 - ZU_PS_POWER		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page16 of 24
Filename: ZU_PS_POWER.SchDoc			

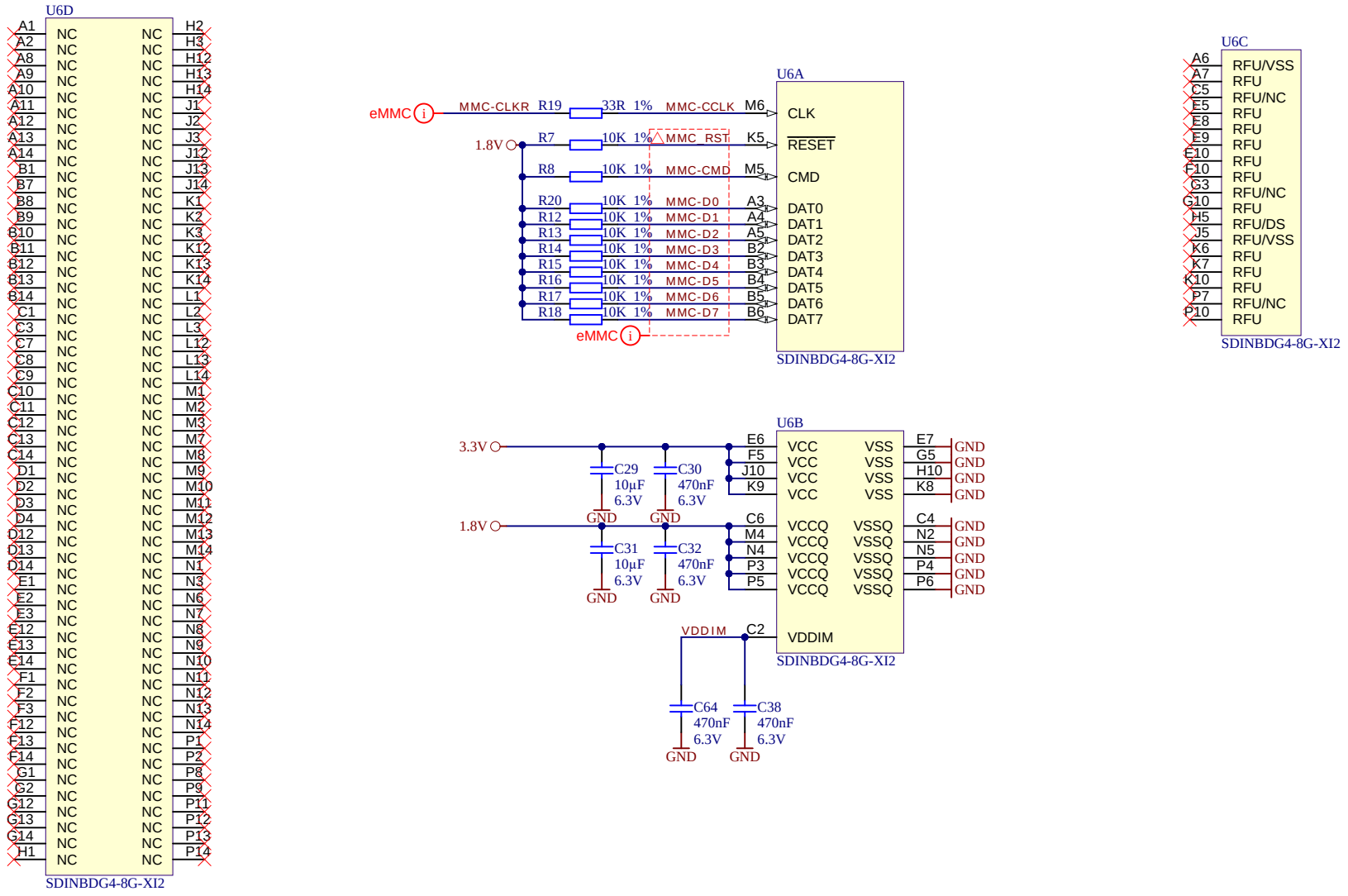


trenz electronic	Title: TE0820 - CLK		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page17 of 24
Filename: CLK.SchDoc			

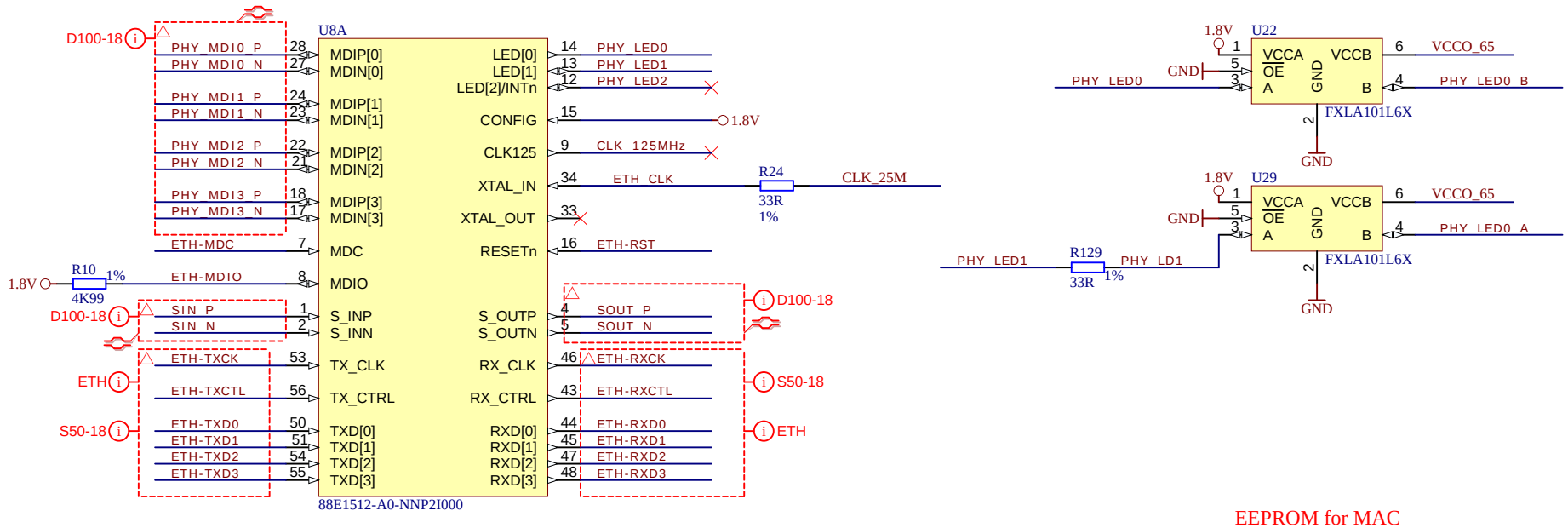

DDR4_ADDR
VTT
R23 1% 39R DDR4-BA0
R25 1% 39R DDR4-BA1
R26 1% 39R DDR4-A8
R27 1% 39R DDR4-A6
R28 1% 39R DDR4-A15
R29 1% 39R DDR4-A0
R30 1% 39R DDR4-CS
R94 1% 39R DDR4-ACT
R96 1% 39R DDR4-A16
R97 1% 39R DDR4-A10
R100 1% 39R DDR4-A1
R101 1% 39R DDR4-A12
R102 1% 39R DDR4-A17
R103 1% 39R DDR4-A9
R104 1% 39R DDR4-CKE0
R105 1% 39R DDR4-A14
R106 1% 39R DDR4-A2
R107 1% 39R DDR4-BG0
R108 1% 39R DDR4-A4
R109 1% 39R DDR4-A7
R110 1% 39R DDR4-ODT0
R111 1% 39R DDR4-PAR
R112 1% 39R DDR4-A5
R113 1% 39R DDR4-A11
R114 1% 39R DDR4-A13
R115 1% 39R DDR4-A3
R92 1% 39R DDR4-BG1
DDR_1V2
R31 49R9 1%
DDR4-ALERT
U2A
DDR_CTRL
DDR4-CLK0_P
DDR4-CLK0_N
DDR4-CKE0
DDR4-CS
DDR4-ODT0
DDR4-PAR
DDR4-ACT
DDR4-A0
DDR4-A1
DDR4-A2
DDR4-A3
DDR4-A4
DDR4-A5
DDR4-A6
DDR4-A7
DDR4-A8
DDR4-A9
DDR4-A10
DDR4-A11
DDR4-A12
DDR4-A13
DDR4-A14
DDR4-A15
DDR4-A16
DDR4-A17
DDR4-BA0
DDR4-BA1
DDR4-BG0
DDR4-BG1
DDR4-TEN
DDR4-RESET
CK_t
CK_c
CKE
CS
ODT
PAR
ACT
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10/AP
A11
A12/BC
A13
WE/A14
CAS/A15
RAS/A16
NC/A17
BA0
BA1
BG0
VSS/BG1
TEN
RESET
ALERT
DML/DBIL
DQL0
DQL1
DQL2
DQL3
DQL4
DQL5
DQL6
DQL7
DQSL_t
DQSL_c
DMU/DBIU
DQU0
DQU1
DQU2
DQU3
DQU4
DQU5
DQU6
DQU7
DQSU_t
DQSU_c
K4A8G165WB-BIRC
LANE2
DDR4-DM2
DQ21
DQ17
DQ20
DQ19
DQ22
DQ18
DQ23
DQ16
DDR4-DQS2_P
DDR4-DQS2_N
LANE3
DDR4-DM3
DQ24
DQ28
DQ27
DQ29
DQ25
DQ31
DQ26
DQ30
DDR4-DQS3_P
DDR4-DQS3_N
R91 0R 1%
GND
DDR_CTRL
DDR4-ALERT
U2B
DDR_2V5
VPP
VPP
VDD
VDDQ
VSS
VSSQ
ZQ
VSS/UZQ
VREFCA
VREFA
R59 240R
R68 0R
C113 470nF
C114 10µF
C115 470nF
C119 10µF
C120 10µF
C121 470nF
C122 470nF
C123 470nF
C138 470nF
DDR_1V2
VTT
C66 10µF
C68 10µF
C69 10µF
C70 10µF
R32 4K7 1%
DDR4-RESET
R33 33R
R34 33R
C71 10nF 10V X7R
DDR_1V2
trenz electronic
Title: TE0820 - DDR4_1_RAM
A4
Number: TE0820 3AE21MA
Rev. 05
Date: 2022-05-10
Copyright: Trenz Electronic GmbH
Page18 of 24
Filename: DDR4-RAM.SchDoc



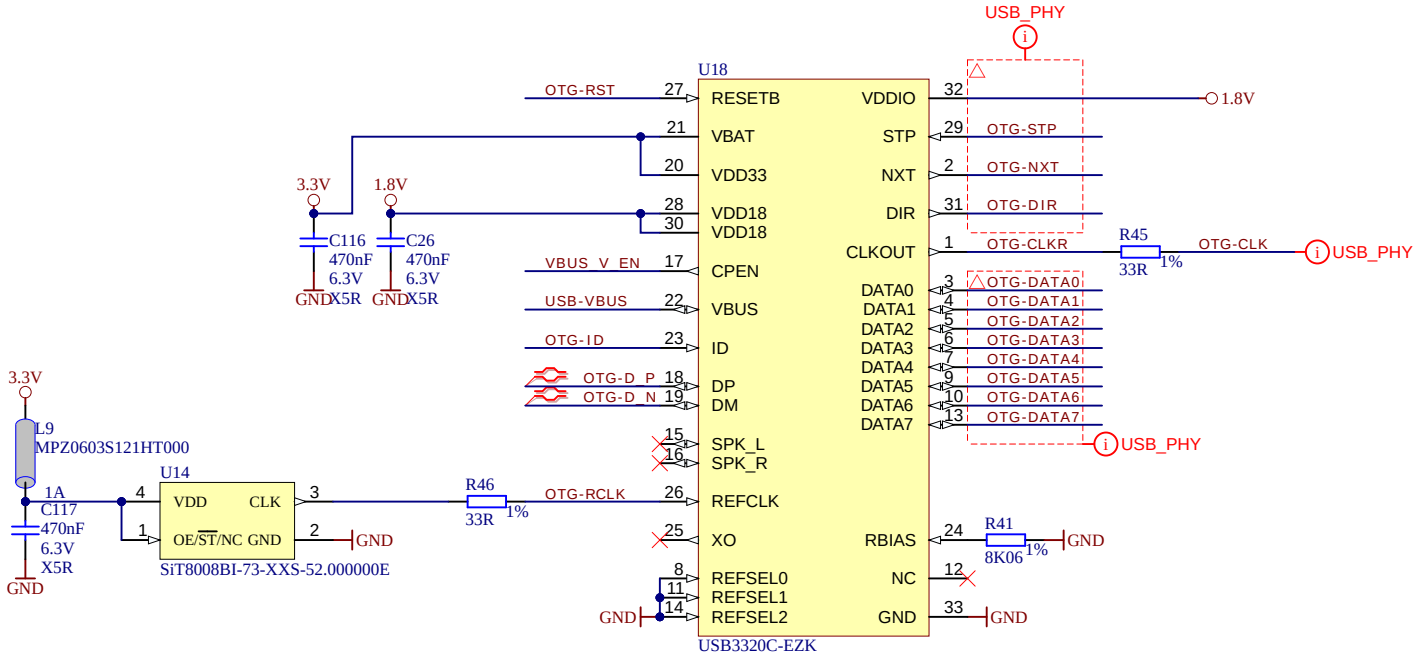
Title: TE0820 - DDR4_2_RAM			
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page 19 of 24
Filename: DDR4-RAM_2.SchDoc			



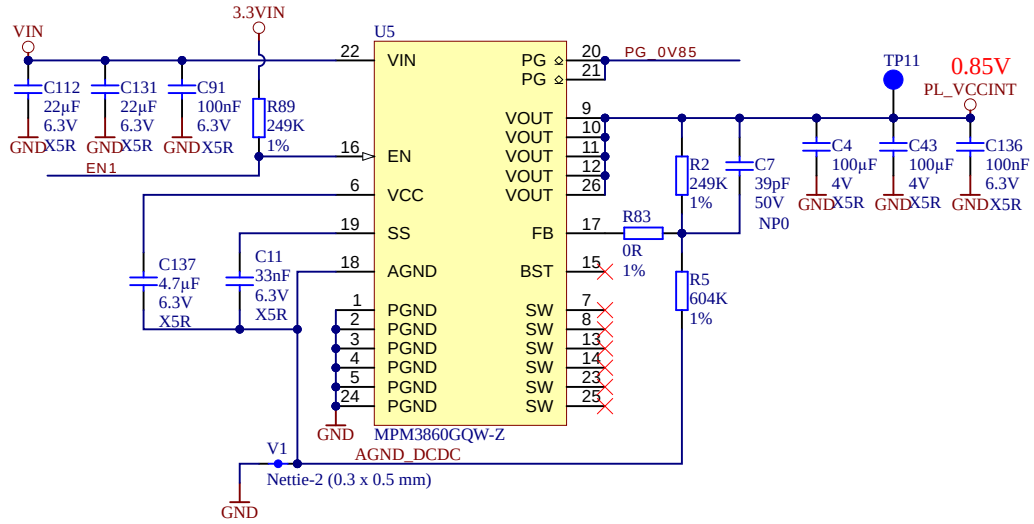
trenz electronic	Title: TE0820 - eMMC		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page20 of 24
Filename: eMMC.SchDoc			

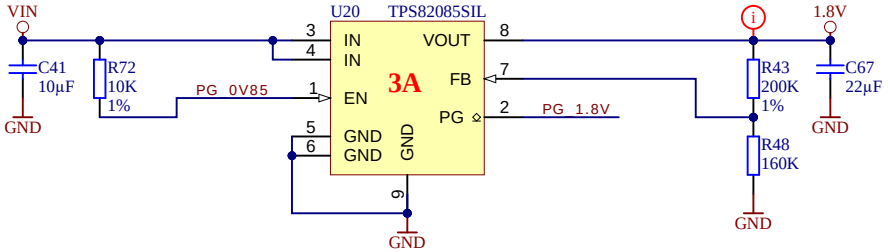


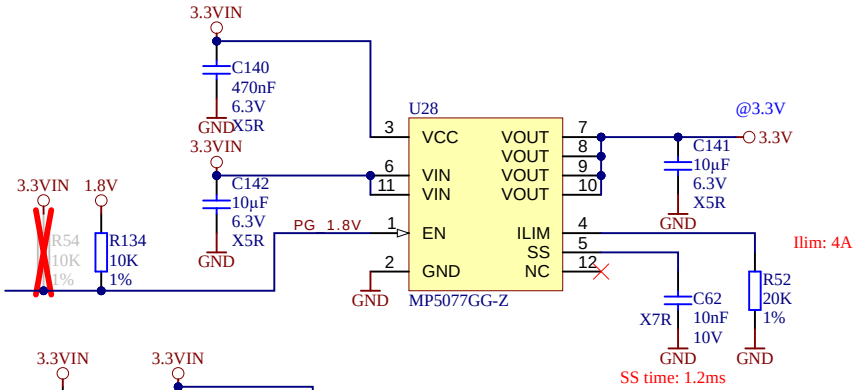
Title: TE0820 - Eth_PHY			
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page21 of 24
Filename: ETH-PHY.SchDoc			

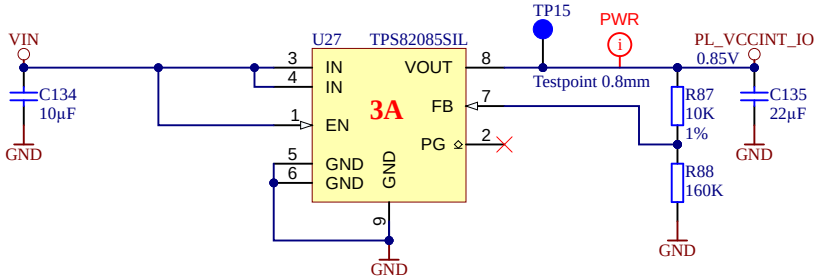


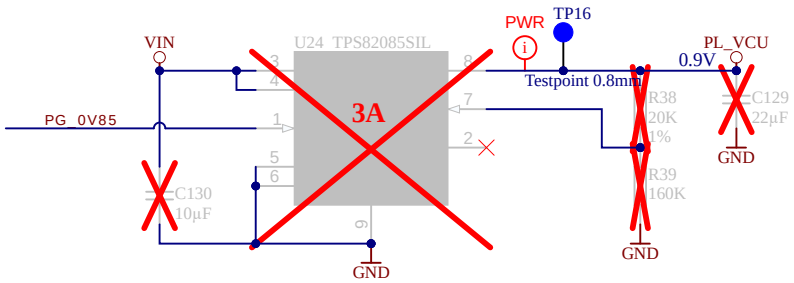
trenz electronic	Title: TE0820 - USB_PHY		
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page22 of 24
Filename: USB-PHY.SchDoc			

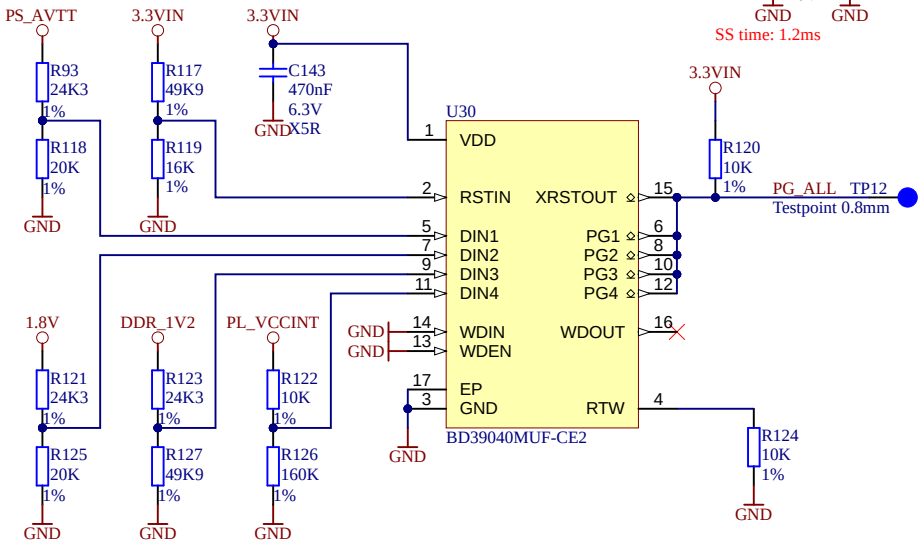






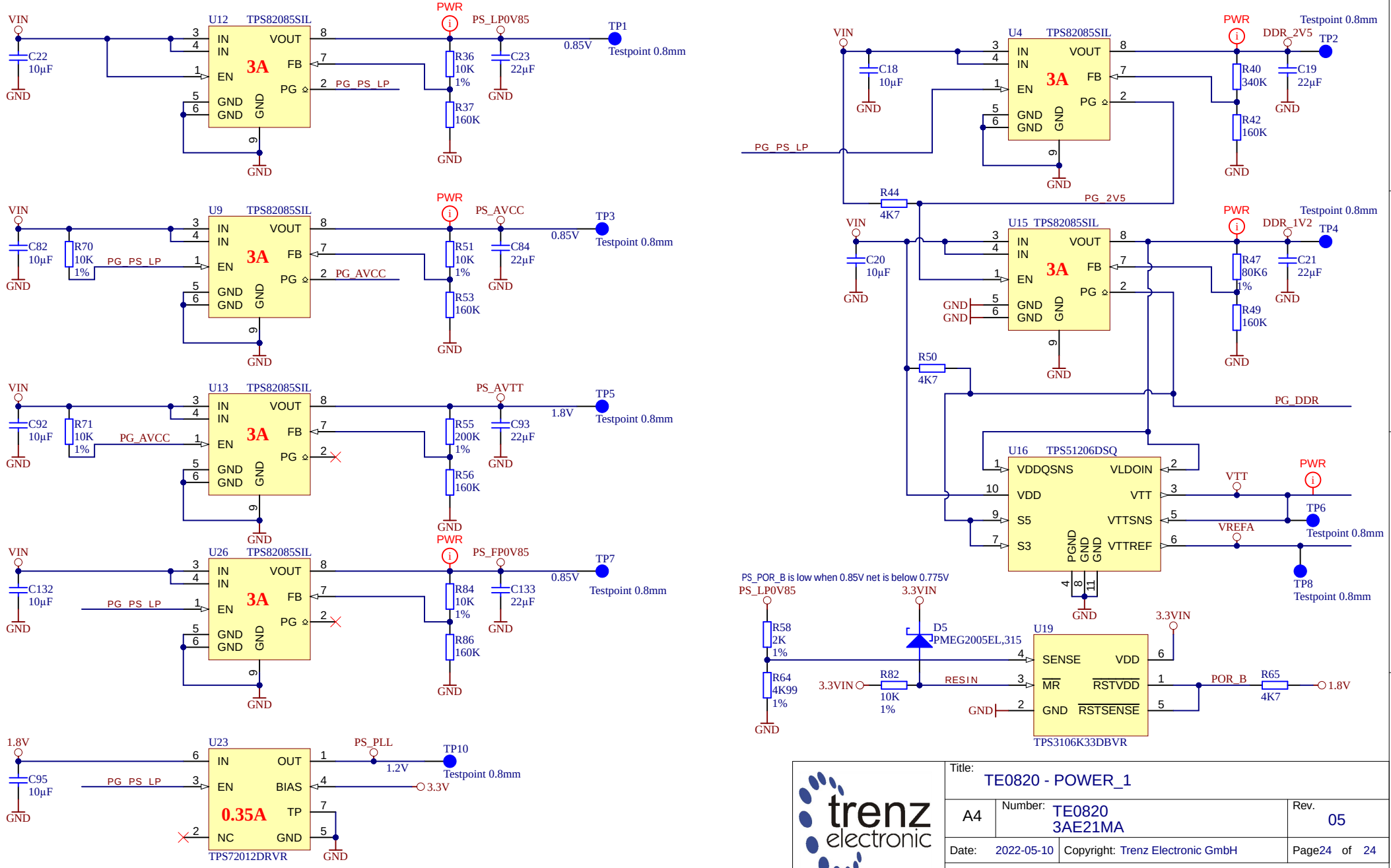






trenz electronic

Title: TE0820 - POWER			
A4	Number: TE0820 3AE21MA		Rev. 05
Date: 2022-05-10	Copyright: Trenz Electronic GmbH		Page23 of 24
Filename: POWER.SchDoc			


VIN
U12 TPS82085SIL
IN
IN
EN
GND
GND
VOUT
FB
PG
GND
3A
PWR
PS_LP0V85
TP1
0.85V
Testpoint 0.8mm
C22
10µF
R36
10K
1%
R37
160K
C23
22µF
PG_PS_LP
U9 TPS82085SIL
PS_AVCC
TP3
R70
10K
1%
R51
10K
1%
R53
160K
C82
10µF
C84
22µF
PG_AVCC
U13 TPS82085SIL
PS_AVTT
TP5
1.8V
R71
10K
1%
R55
200K
1%
R56
160K
C92
10µF
C93
22µF
U26 TPS82085SIL
PS_FP0V85
TP7
R84
10K
1%
R86
160K
C132
10µF
C133
22µF
1.8V
U23
PS_PLL
TP10
1.2V
3.3V
Testpoint 0.8mm
C95
10µF
0.35A
TPS72012DRVR
U4 TPS82085SIL
DDR_2V5
TP2
R40
340K
R42
160K
C18
10µF
C19
22µF
R44
4K7
PG_2V5
U15 TPS82085SIL
DDR_1V2
TP4
R47
80K6
1%
R49
160K
C20
10µF
C21
22µF
R50
4K7
PG_DDR
U16 TPS51206DSQ
VDDQSNS
VLDOIN
VDD
VTT
S5
VTTSNS
S3
VTTREF
PGND
GND
GND
VTT
VREFA
TP6
TP8
PS_POR_B is low when 0.85V net is below 0.775V
PS_LP0V85
3.3VIN
R58
2K
1%
R64
4K99
1%
D5
PMEG2005EL,315
U19
SENSE
VDD
MR
RSTVDD
GND
RSTSENSE
RES1N
R82
10K
1%
POR_B
R65
4K7
TPS3106K33DBVR
trenz electronic
Title: TE0820 - POWER_1
A4
Number: TE0820 3AE21MA
Rev. 05
Date: 2022-05-10
Copyright: Trenz Electronic GmbH
Page24 of 24
Filename: POWER_1.SchDoc