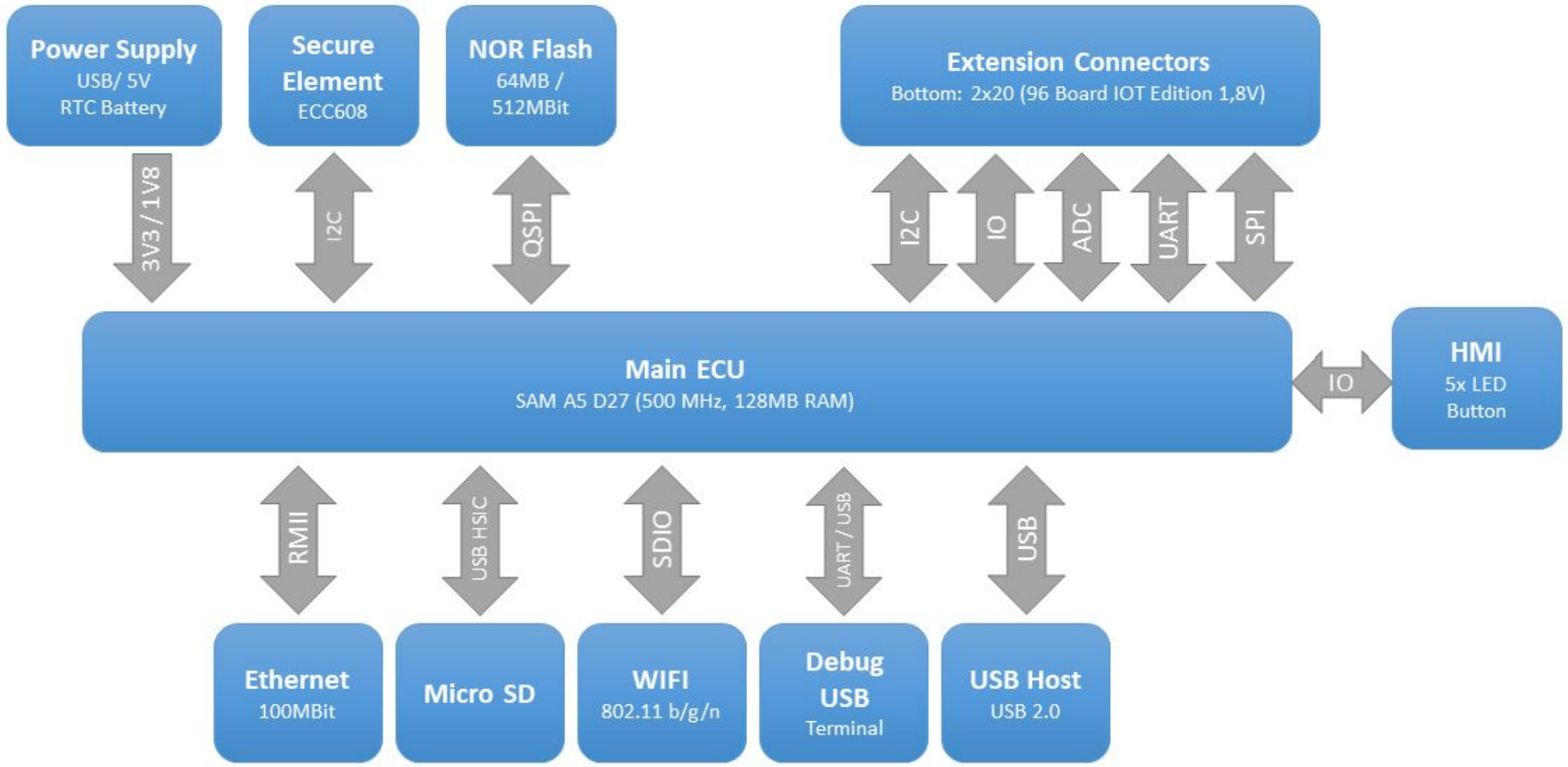
NTSecureGateway HelmsDeep96



More Informations on Github:

https://github.com/ArrowElectronics/hd96

NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet: Block Diagram		
	File Name: HD96_Block-Diagram.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:50		Blatt 1 von 16

Power Supply
HD96_PowerSupply.SchDoc

nRST
nRST
VDDFUSE_EN
LOWQ#
USBA_VBUS_Feedback

SAMA5 Supply & USB
HD96_SAMA5-Clock.SchDoc

VDDIODDR
VDDIODDR
VDDCORE
USBA_DP
USBA_DM
nRST
WAKEUP

USB Host
HD96_USB-Host.SchDoc

USBB_DM
USBB_DP
PD19/USBB_OVCUR
PA27/USBB_VBUS_EN

Ethernet
HD96_Ethernet.SchDoc

nRST
nRST
PD22_TWCK0_EEPROM
PD21_TWD0_EEPROM
GTXCK_PD09
GTXEN_PD10
GRXDV_PD11
GRXER_PD12
GRX0_PD13
GRX1_PD14
GTX0_PD15
GTX1_PD16
GMDC_PD17
GMDIO_PD18
ETH_INT_IRQ_PD31

96 Board IOT Edition 1,8V Expansion Connector
HD96_ExpansionConnecter.SchDoc

nRST
nRST
WAKEUP
PC19/FLEXCOM3_IO1_UART0_RxD
PC20/FLEXCOM3_IO0_UART0_TxD
PC21/FLEXCOM3_IO3_UART0_CTS
PC22/FLEXCOM3_IO4_UART0_RTS
PC29/FLEXCOM4_IO1_UART1_RxD
PC28/FLEXCOM4_IO0_UART1_TxD
PB29/FLEXCOM0_IO1_TWCK_I2C0_SCL
PB28/FLEXCOM0_IO0_TWD_I2C0_SDA
PA23/FLEXCOM1_IO1_TWCK_I2C1_SCL
PA24/FLEXCOM1_IO0_TWD_I2C1_SDA
PA14/SPI0_SPCK_SPI0_SCLK
PA15/SPI0_MOSI_SPI0_DOUT
PA16/SPI0_MISO_SPI0_DIN
PA17/SPI0_NPCS0_SPI0_CS
PB17/I2SDI1_PCM_DI
PB18/I2SDO1_PCM_DO
PB15/I2SCK1_PCM_CLK
PB16/I2SMCK1_PCM_FS
PB24_GPIO_A
PC26/CAN_TX_GPIO_B
PB25_GPIO_C
PC27/CAN_RX_GPIO_D
PB26_GPIO_E
PB21_GPIO_F
PB27_GPIO_G
PB12_GPIO_H
PB13_GPIO_I
PD25_GPIO_J
PB14_GPIO_K
PD26_GPIO_L

HMI: Buttons & LEDs
HD96_HMI.SchDoc

nRST
nRST
WAKEUP
PA29/BUTTON
PC12/LED1
PC13/LED2
PC15/LED3
PC17/LED4

SAMA5 I/Os
HD96_SAMA5-IO.SchDoc

VDDFUSE_EN
LOWQ#
USBA_VBUS_Feedback
PD19/USBB_OVCUR
PA27/USBB_VBUS_EN
PD22_TWCK0_EEPROM
PD21_TWD0_EEPROM
GTXCK_PD09
GTXEN_PD10
GRXDV_PD11
GRXER_PD12
GRX0_PD13
GRX1_PD14
GTX0_PD15
GTX1_PD16
GMDC_PD17
GMDIO_PD18
ETH_INT_IRQ_PD31
PC19/FLEXCOM3_IO1_UART0_RxD
PC20/FLEXCOM3_IO0_UART0_TxD
PC21/FLEXCOM3_IO3_UART0_CTS
PC22/FLEXCOM3_IO4_UART0_RTS
PC29/FLEXCOM4_IO1_UART1_RxD
PC28/FLEXCOM4_IO0_UART1_TxD
PB29/FLEXCOM0_IO1_TWCK_I2C0_SCL
PB28/FLEXCOM0_IO0_TWD_I2C0_SDA
PA23/FLEXCOM1_IO1_TWCK_I2C1_SCL
PA24/FLEXCOM1_IO0_TWD_I2C1_SDA
PA14/SPI0_SPCK_SPI0_SCLK
PA15/SPI0_MOSI_SPI0_DOUT
PA16/SPI0_MISO_SPI0_DIN
PA17/SPI0_NPCS0_SPI0_CS
PB17/I2SDI1_PCM_DI
PB18/I2SDO1_PCM_DO
PB15/I2SCK1_PCM_CLK
PB16/I2SMCK1_PCM_FS
PB24_GPIO_A
PC26/CAN_TX_GPIO_B
PB25_GPIO_C
PC27/CAN_RX_GPIO_D
PB26_GPIO_E
PB21_GPIO_F
PB27_GPIO_G
PB12_GPIO_H
PB13_GPIO_I
PD25_GPIO_J
PB14_GPIO_K
PD26_GPIO_L
PA29/BUTTON
PC12/LED1
PC13/LED2
PC15/LED3
PC17/LED4
RTCC_SPI_PC0[1..4]
PC00/RTCC_EVHS
PC06/RTCC_WDO
PC07/RTCC_BOOT
PB30/RTCC_EVLS
PB31/RTCC_IRQ
PD05_TWCK1_ATECC
PD04_TWD1_ATECC
PA22/SDMMC1_CK
PA28/SDMMC1_CDA
PA18/SDMMC1_DAT0
PA19/SDMMC1_DAT1
PA20/SDMMC1_DAT2
PA21/SDMMC1_DAT3
PA30/SDMMC1_CD
PD08_DISABLE_BOOT
QSPI1_Flash_PB[5..10]
PA09_EN_WLAN_3V3
SDIO_WIFI_PA0[0..5]
PA06/WIFI_WAKE
PA07/WIFI_RESET_N
PA10/WIFI_CHIP_EN
PA11/WIFI_IRQN
PA12/WIFI_GPIO_5
PA08/WIFI_GPIO_1
PA13/WIFI_GPIO_6
PD27/JTAG_TCK
PD28/JTAG_TDI
PD29/JTAG_TDO
PD30/JTAG_TMS
PD02/DBG_UART_RX
PD03/DBG_UART_TX

RTC
HD96_RTC.SchDoc

RTCC_SPI_PC0[1..4]
PC00/RTCC_EVHS
PC06/RTCC_WDO
PC07/RTCC_BOOT
PB30/RTCC_EVLS
PB31/RTCC_IRQ

Secure Element
HD96_Secure-Element.SchDoc

PD05_TWCK1_ATECC
PD04_TWD1_ATECC

µSD Card Interface + Flash
HD96_Flash.SchDoc

PA22/SDMMC1_CK
PA28/SDMMC1_CDA
PA18/SDMMC1_DAT0
PA19/SDMMC1_DAT1
PA20/SDMMC1_DAT2
PA21/SDMMC1_DAT3
PA30/SDMMC1_CD
PD08_DISABLE_BOOT
QSPI1_Flash_PB[5..10]

WiFI
HD96_WIFI.SchDoc

PA09_EN_WLAN_3V3
SDIO_WIFI_PA0[0..5]
PA06/WIFI_WAKE
PA07/WIFI_RESET_N
PA10/WIFI_CHIP_EN
PA11/WIFI_IRQN
PA12/WIFI_GPIO_5
PA08/WIFI_GPIO_1
PA13/WIFI_GPIO_6

SAMA5 Debug
HD96_SAMA5-Debug.SchDoc

nRST
nRST
PD27/JTAG_TCK
PD28/JTAG_TDI
PD29/JTAG_TDO
PD30/JTAG_TMS
PD02/DBG_UART_RX
PD03/DBG_UART_TX

SAMA5 DDR2
HD96_SAMA5-DDR2.SchDoc

VDDIODDR
VDDIODDR

Revision History
HD96_RevisionHistory.SchDoc

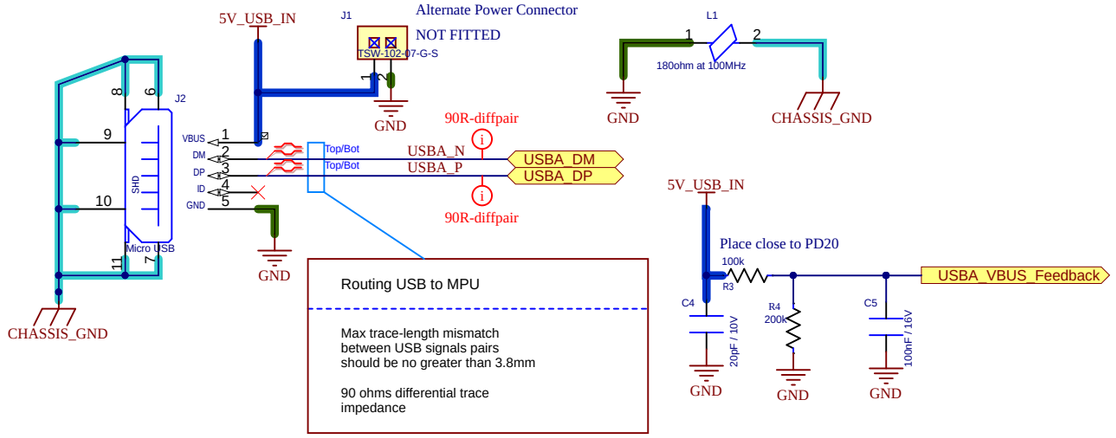
Block Diagram
HD96_Block-Diagram.SchDoc

Z1
label 18x8
Label 18x8

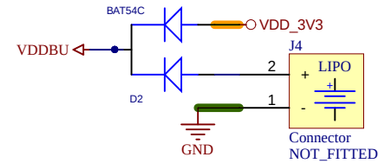
NewTec
System-Entwicklung und Beratung
www.newtec.de

Product: NTSecureGateway HelmsDeep96		
Sheet Cover Sheet		
File Name: HD96_CoverSheet.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
Last Modification: 04.10.2019 17:46:50		Blatt 2 von 16

USB Device + Power Supply Connector (Micro USB)

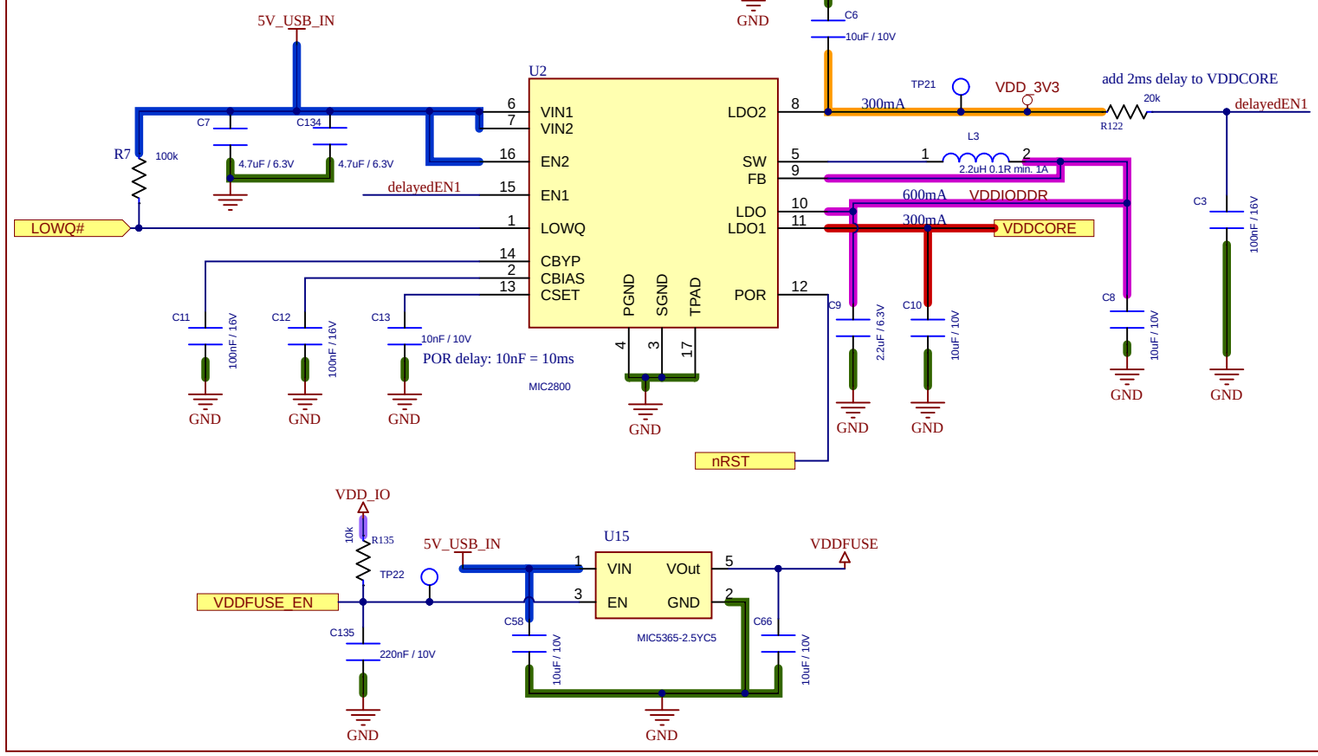


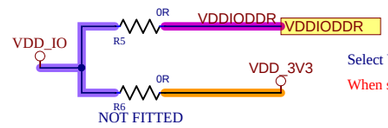
Backup Power Supply



To keep Fuse emulation during Power Down, Supply VDDBU external with 3V3

MIC2800 / MPU Power Supply





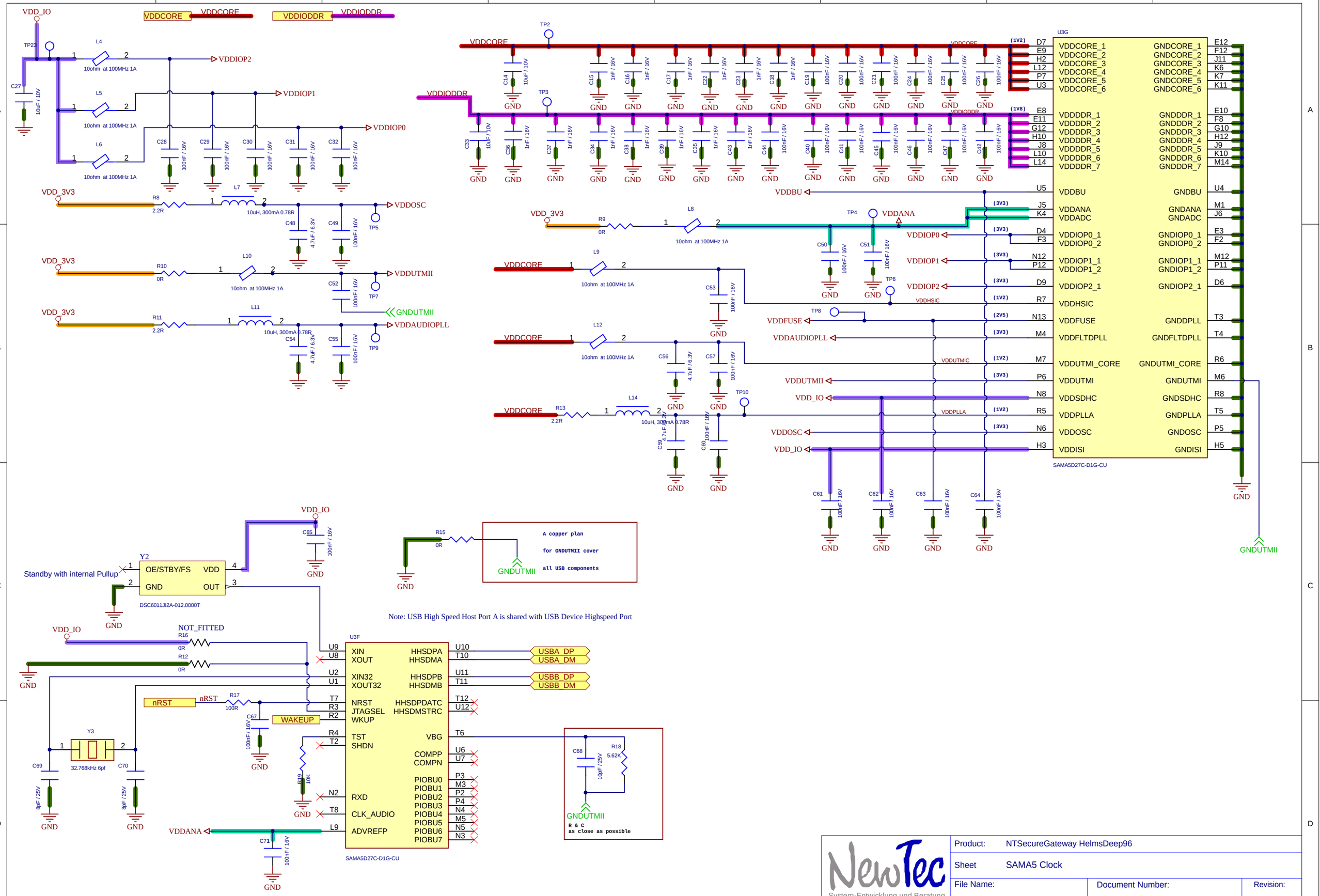
Select VDDIO

When selecting VDDIO, select according NOR Flash Type

5V_USB_IN	- Main power supply from uUSB Device Port
VDD_MAIN_5V	- Line is connected with a Jumper to VDD_5V
VDDIODDR	- 1V8 Volt output from MIC2800 (supplied DDR RAM)
VDDCORE	- 1V25 Volt output Core, including the processor, the embedded memories and the peripherals
VDD_3V3	- additional 3V3 voltage generation (actually powered all peripheral components)
VDDFUSE	- 2V5 Voltage Supply for customer fuse matrix

NewTec
System-Entwicklung und Beratung
www.newtec.de

Product:	NTSecureGateway HelmsDeep96		
Sheet	Power Supply		
File Name: HD96_PowerSupply.SchDoc		Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
Last Modification: 04.10.2019 17:46:51			Blatt 3 von 16

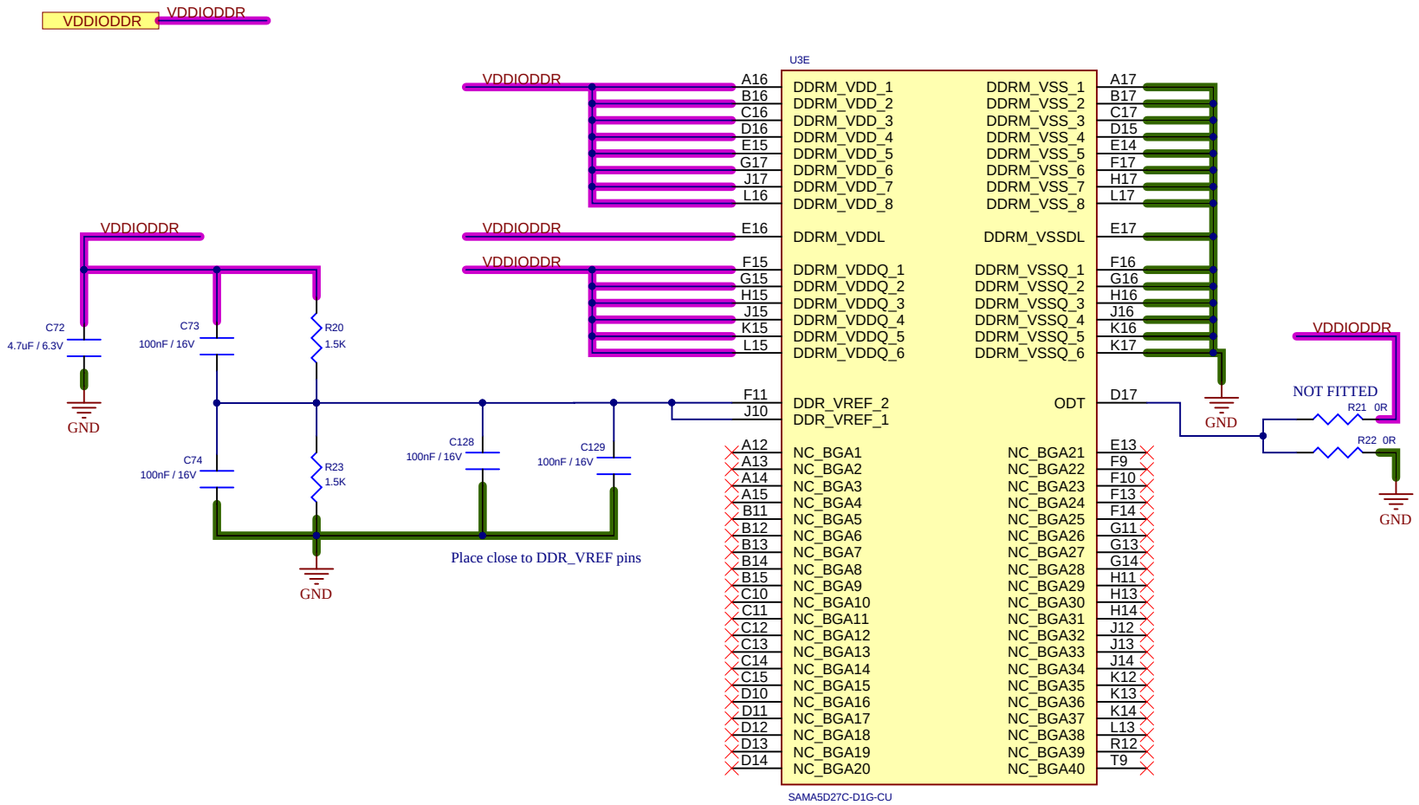


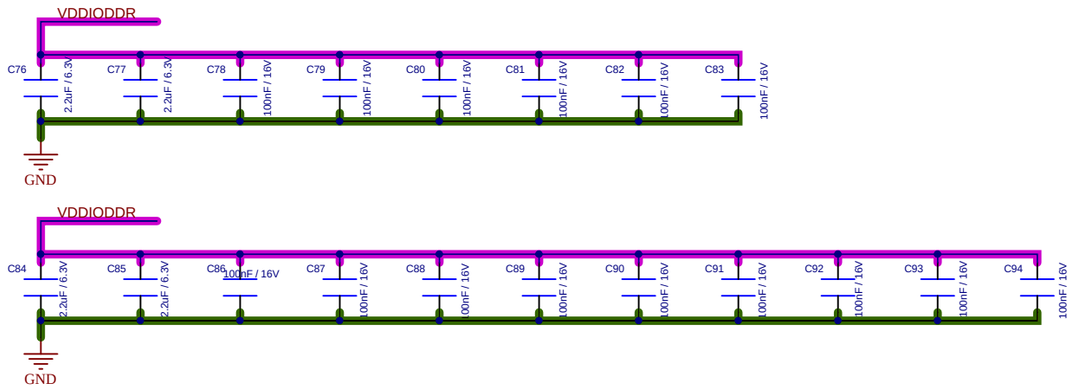
Important: SAMA5D2 SIP devices are not pin-to-pin compatible with SAMA5D2 devices

Product:	NTSecureGateway HelmsDeep96
Sheet	SAMA5 Clock
File Name: HD96_SAMA5-Clock.SchDoc	Document Number: 11648_0008_0002_A-96Board
Last Modification: 04.10.2019 17:46:51	Revision: V 1.3
	Blatt 4 von 16

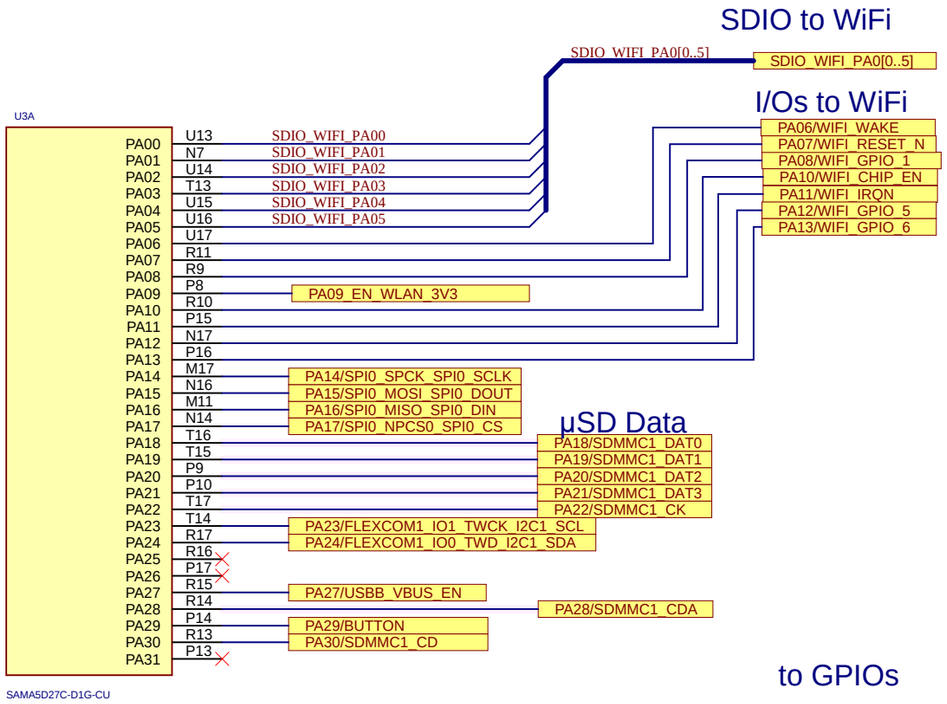
NewTec
System-Entwicklung und Beratung
www.newtec.de

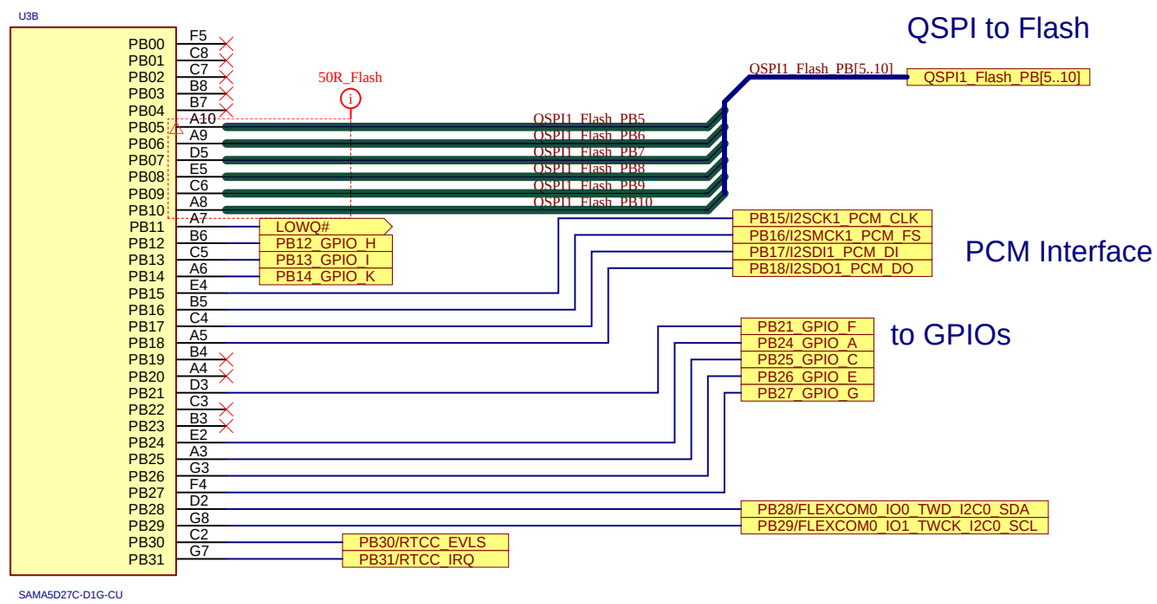
DDR2 Memory

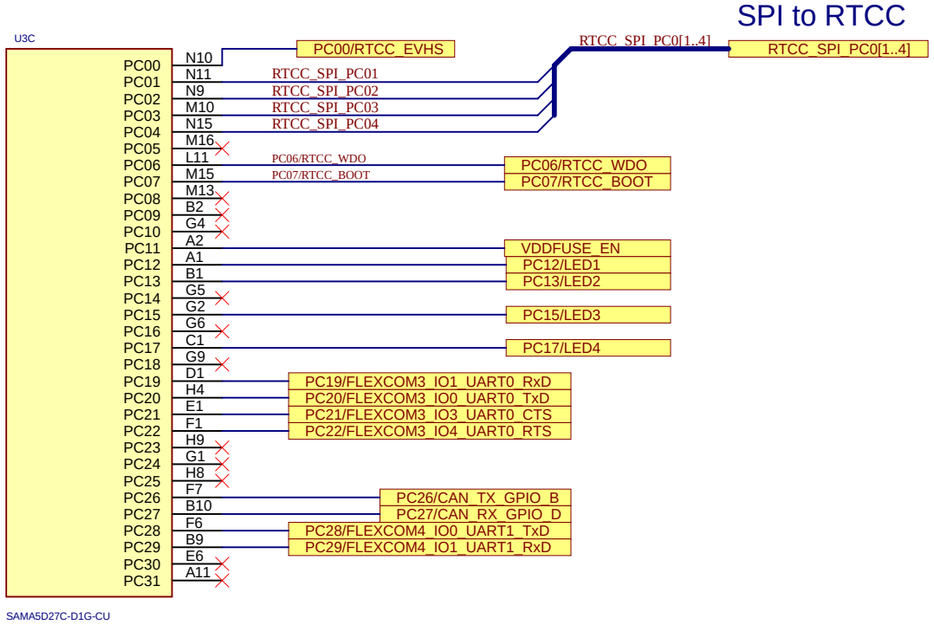


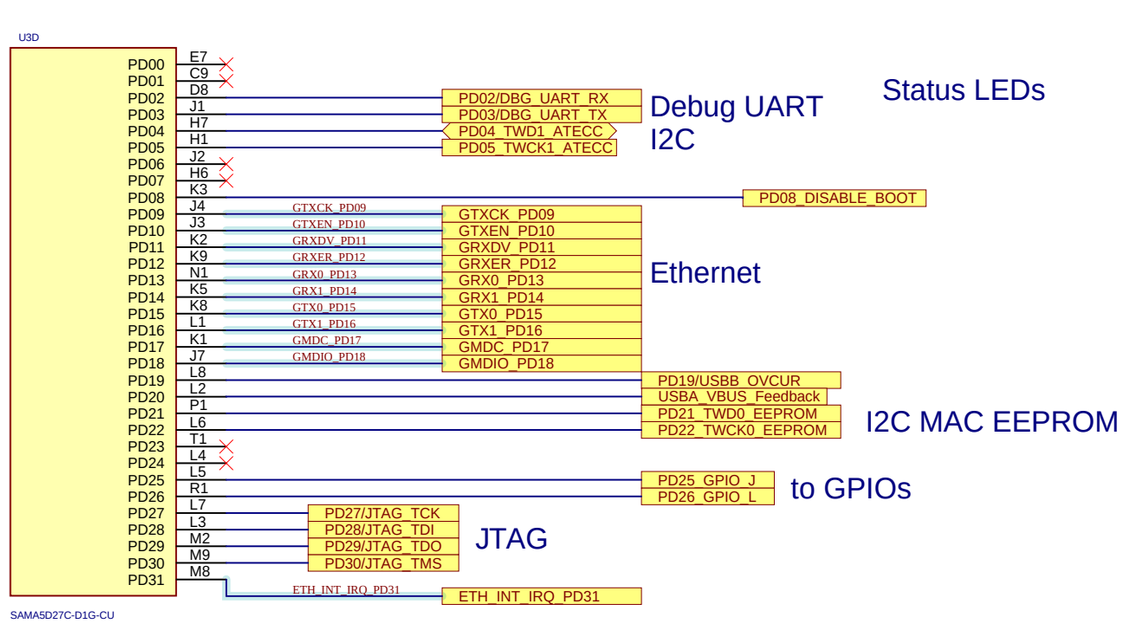


NewTec System-Entwicklung und Beratung www.newtec.de	Product:	NTSecureGateway HelmsDeep96	
	Sheet	SAMA5 DDR2 Memory	
	File Name: HD96_SAMA5-DDR2.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:51		Blatt 5 von 16





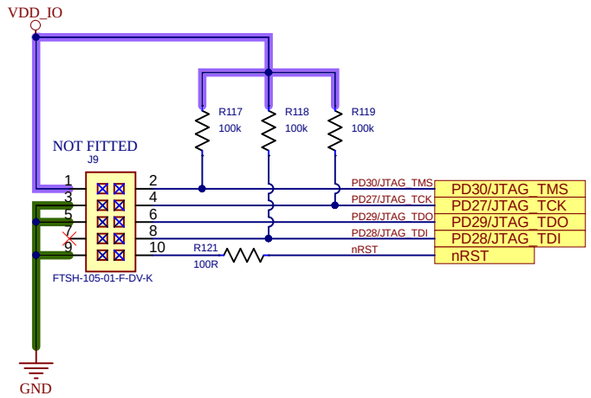




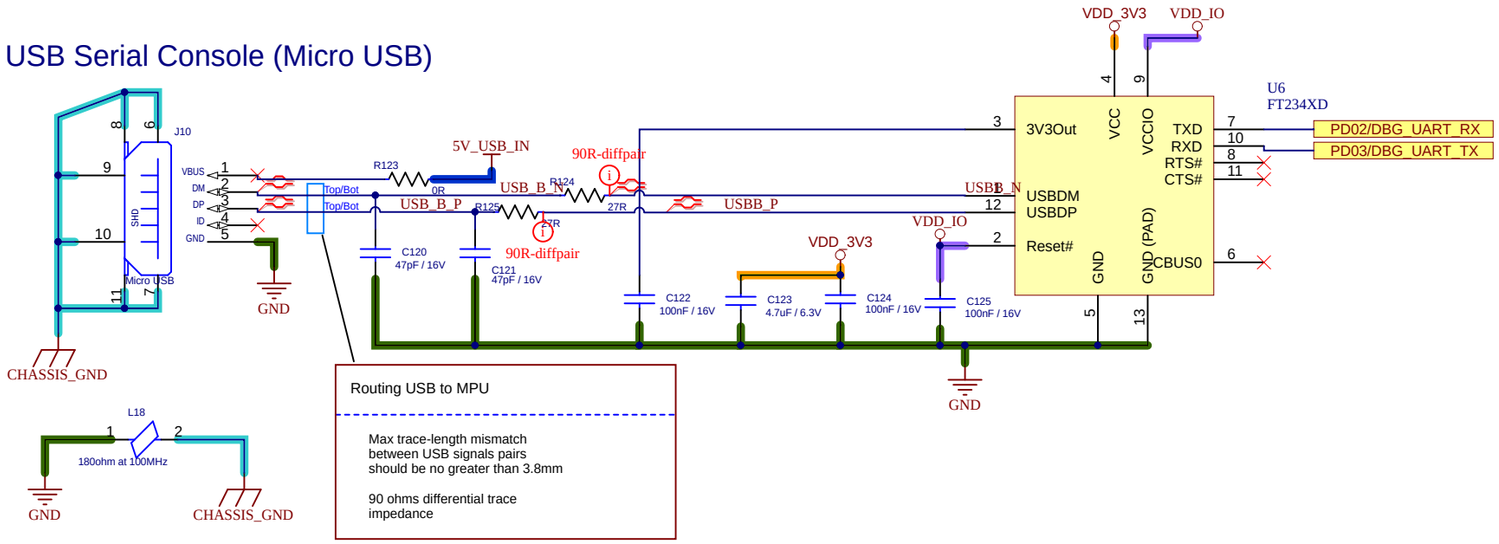
NewTec
System-Entwicklung und Beratung
www.newtec.de

Product: NTSecureGateway HelmsDeep96		
Sheet SAMA5 IOs		
File Name: HD96_SAMA5-IO.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
Last Modification: 04.10.2019 17:46:51		Blatt 6 von 16

JTAG Interface for SAMA5

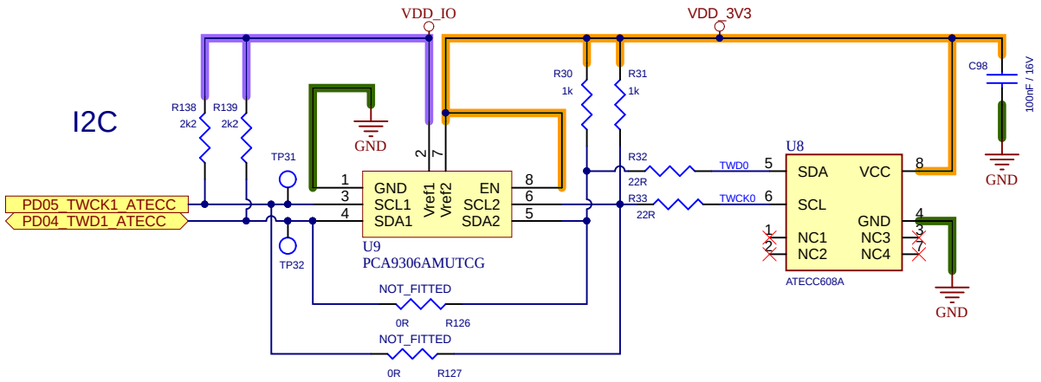


USB Serial Console (Micro USB)



NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet SAMA5 Debug interfaces		
	File Name: HD96_SAMA5-Debug.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:51		Blatt 7 von 16

Secure Element

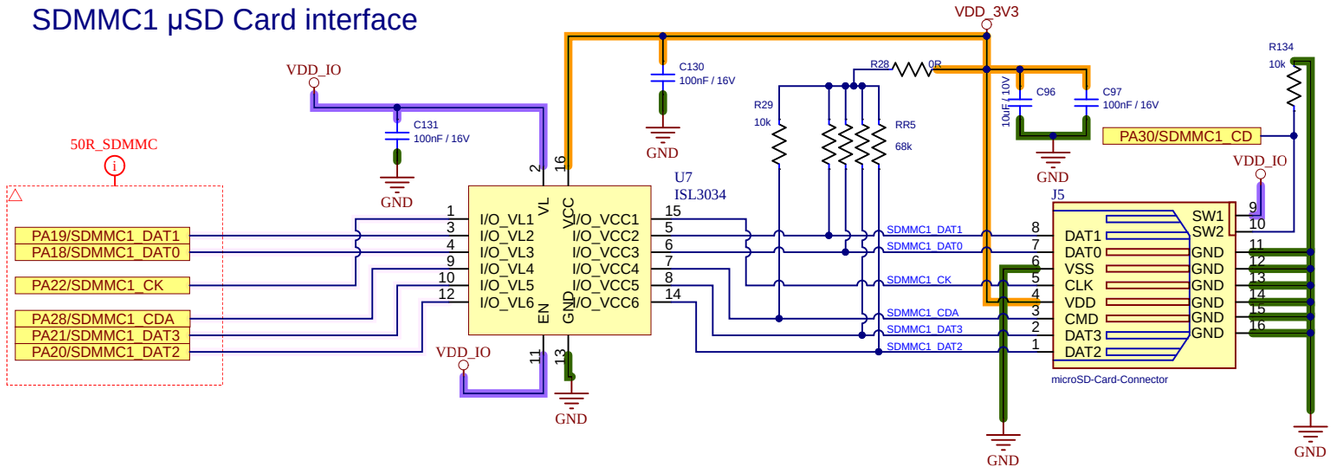


For 3V3 VDDIO remove U9 and Fit R126+R127

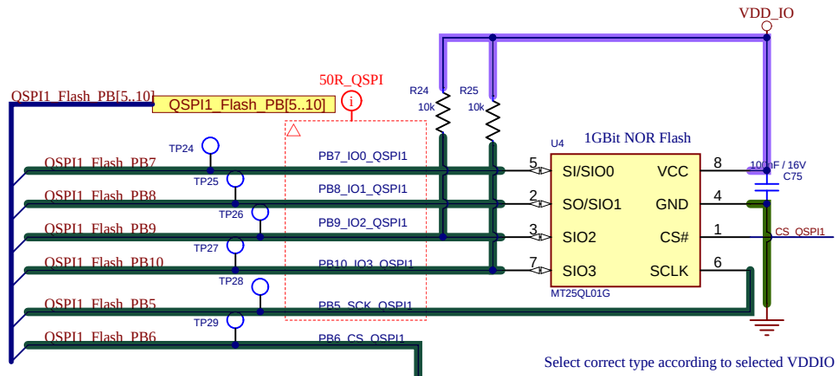
NewTec
System-Entwicklung und Beratung
www.newtec.de

Product:	NTSecureGateway HelmsDeep96		
Sheet	Secure Element ECC608		
File Name: HD96_Secure-Element.SchDoc		Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
Last Modification: 04.10.2019 17:46:51			Blatt 8 von 16

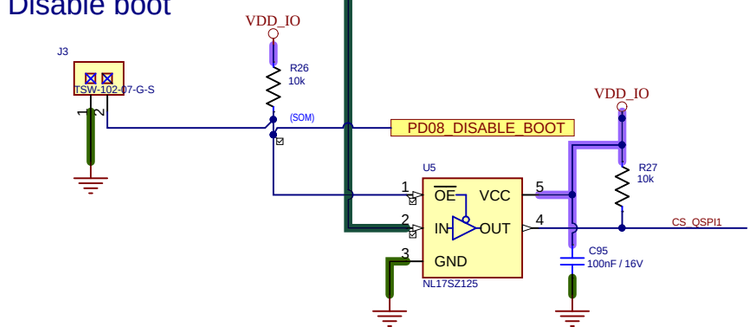
SDMMC1 µSD Card interface



QSPI Flash



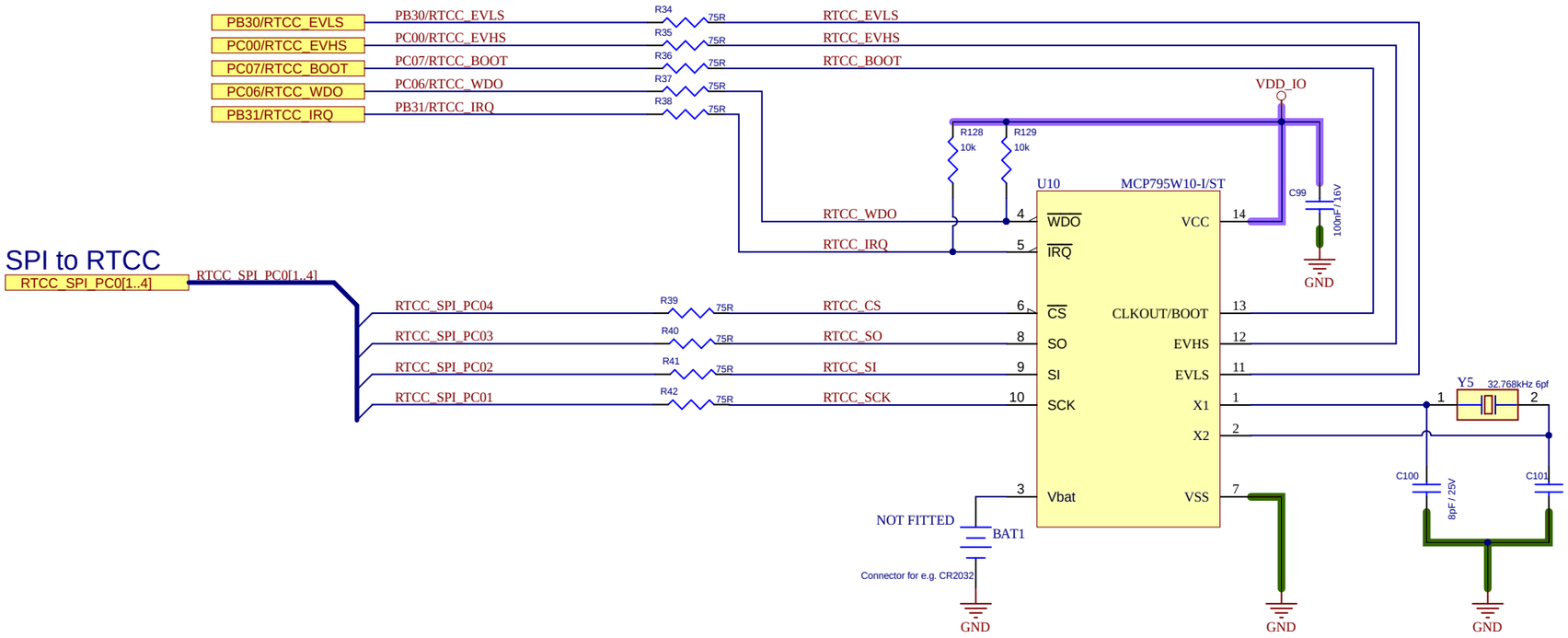
Disable boot



NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet µSD Card interface & Flash		
	File Name: HD96_Flash.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:52		Blatt 9 von 16

Real Time Clock

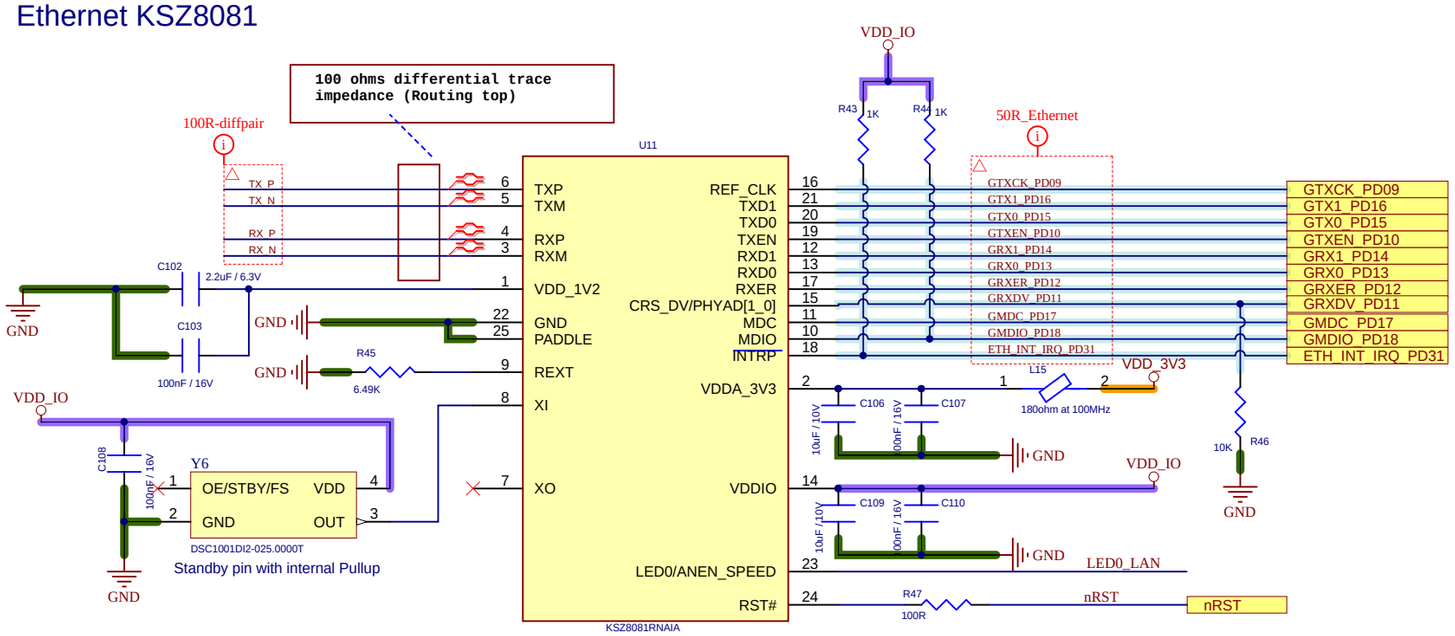
I/O to RTCC

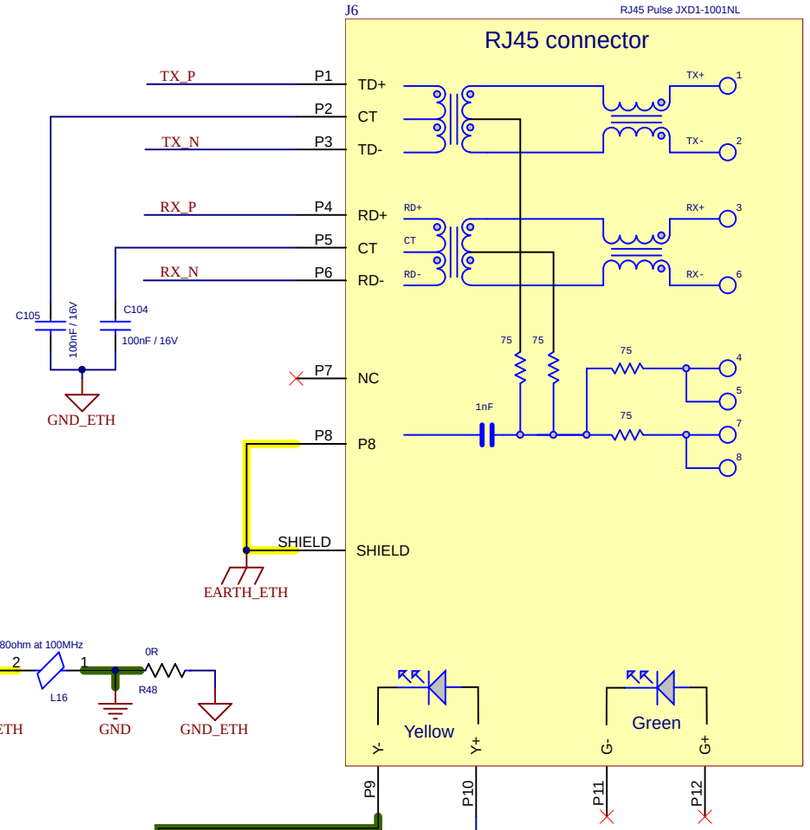


SPI to RTCC

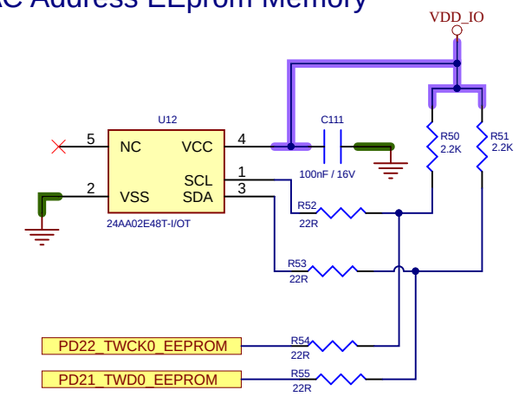
NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet: Independent RTC		
	File Name: HD96_RTC.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:52		Blatt 10von 16

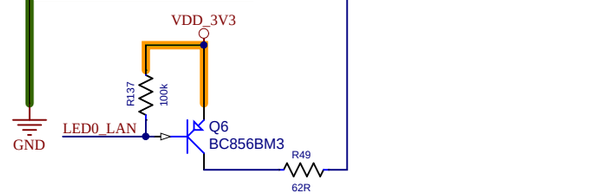
Ethernet KSZ8081





MAC Address EEprom Memory

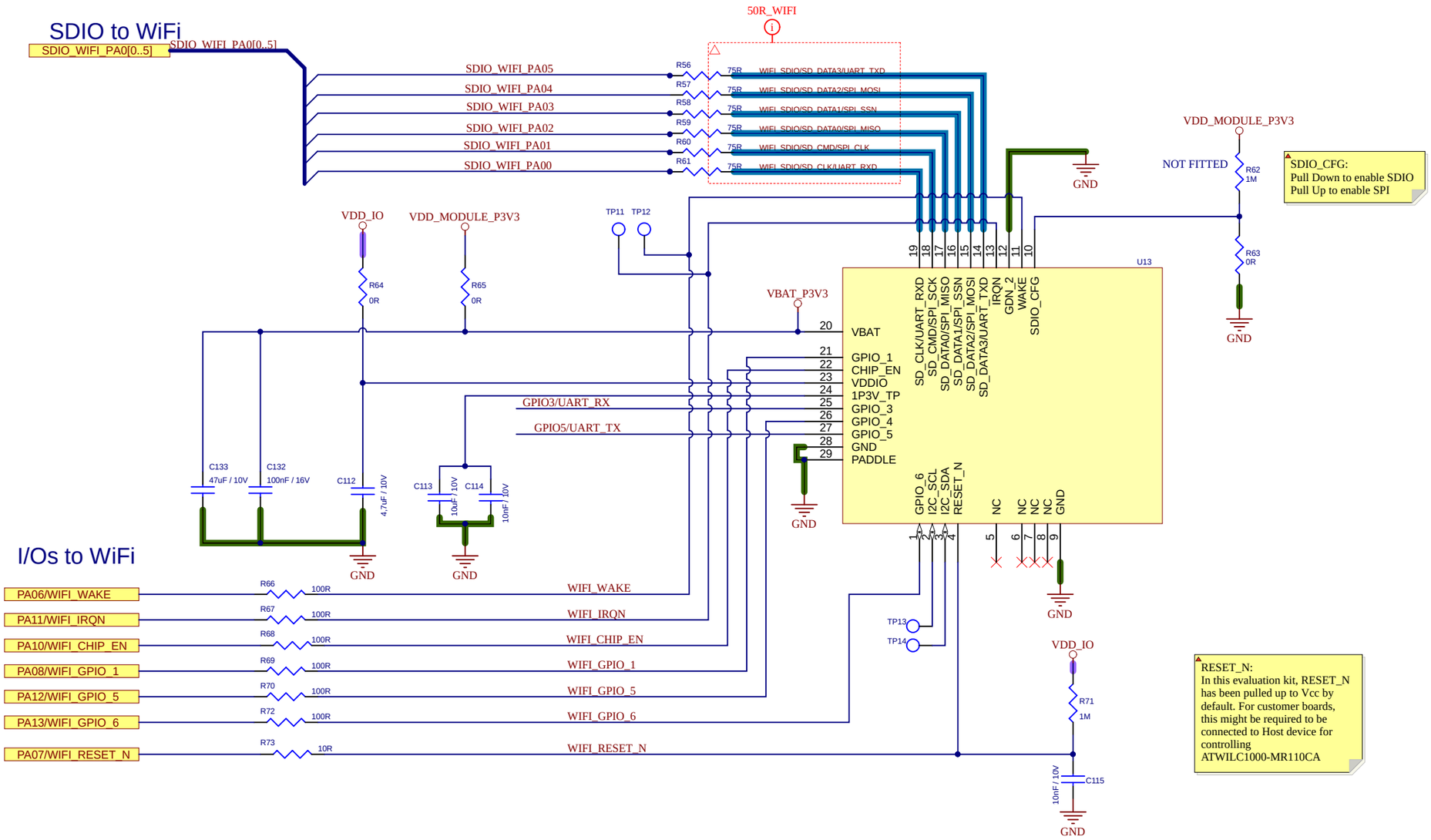




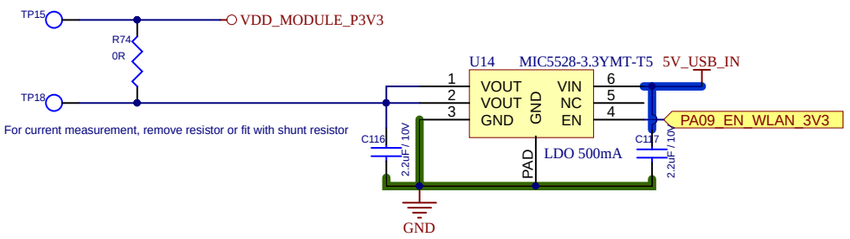
NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet Ethernet		
	File Name: HD96_Ethernet.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:52		Blatt 11 von 16

ATWILC1000-MR110UB

SDIO to WiFi



WIFI CURRENT MEASUREMENT HEADER

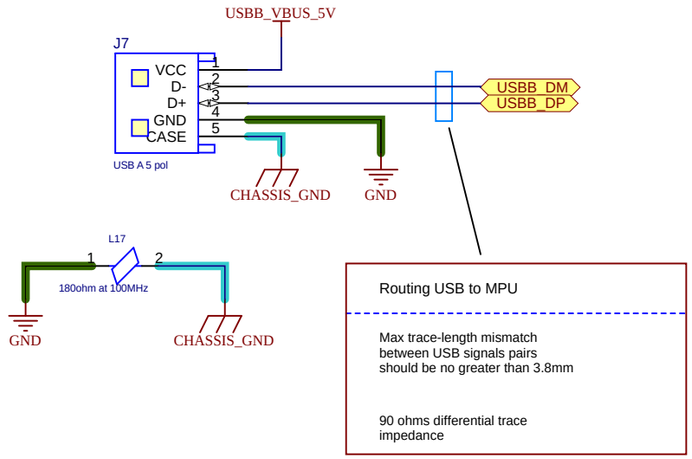


DEBUG UART ATWILC1000

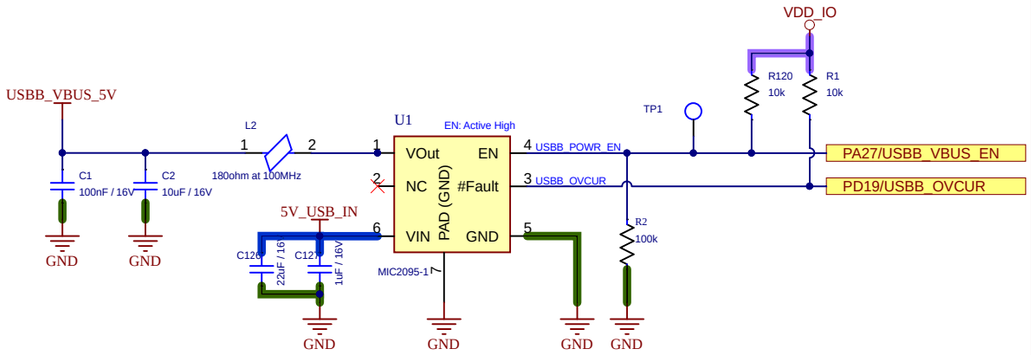
NewTec
System-Entwicklung und Beratung
www.newtec.de

Product:	NTSecureGateway HelmsDeep96		
Sheet	Wifi		
File Name: HD96_WIFI.SchDoc		Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
Last Modification: 04.10.2019 17:46:52			Blatt 12von 16

USB Host (USB Type A connector)

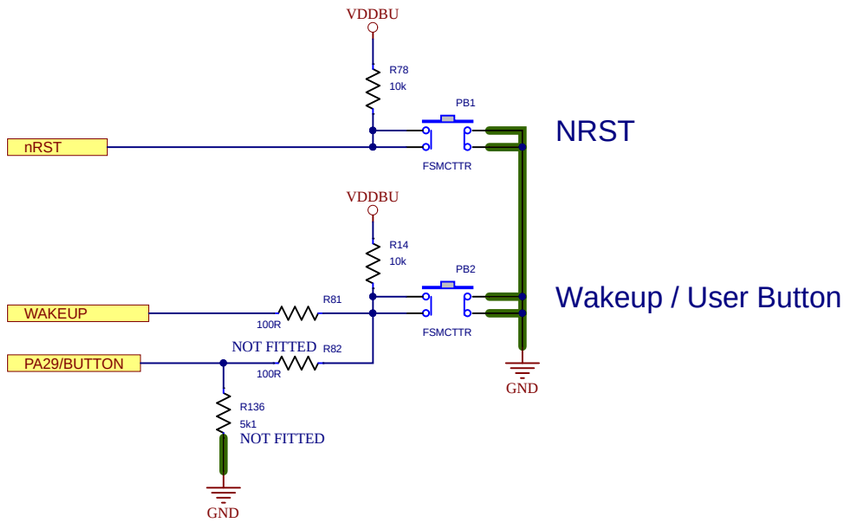


USB Host Power Switch + Current protection



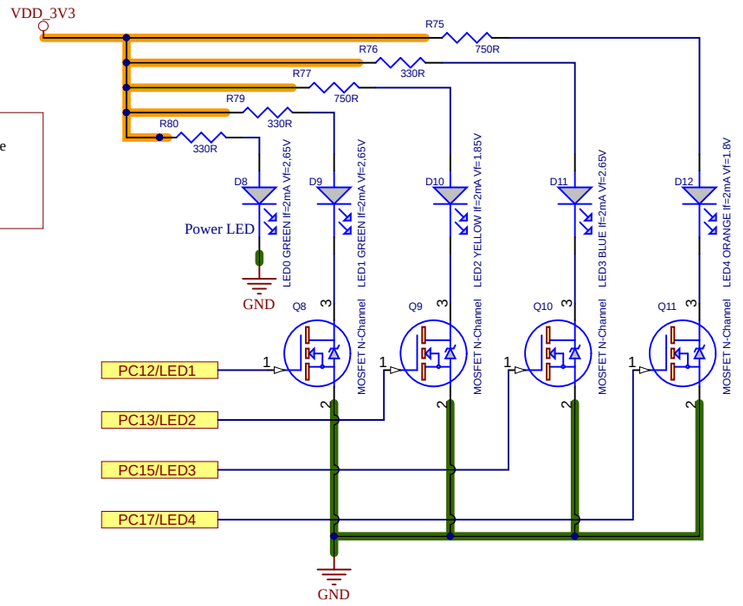
NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet USB Host		
	File Name: HD96_USB-Host.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:52		Blatt 13von 16

System Button



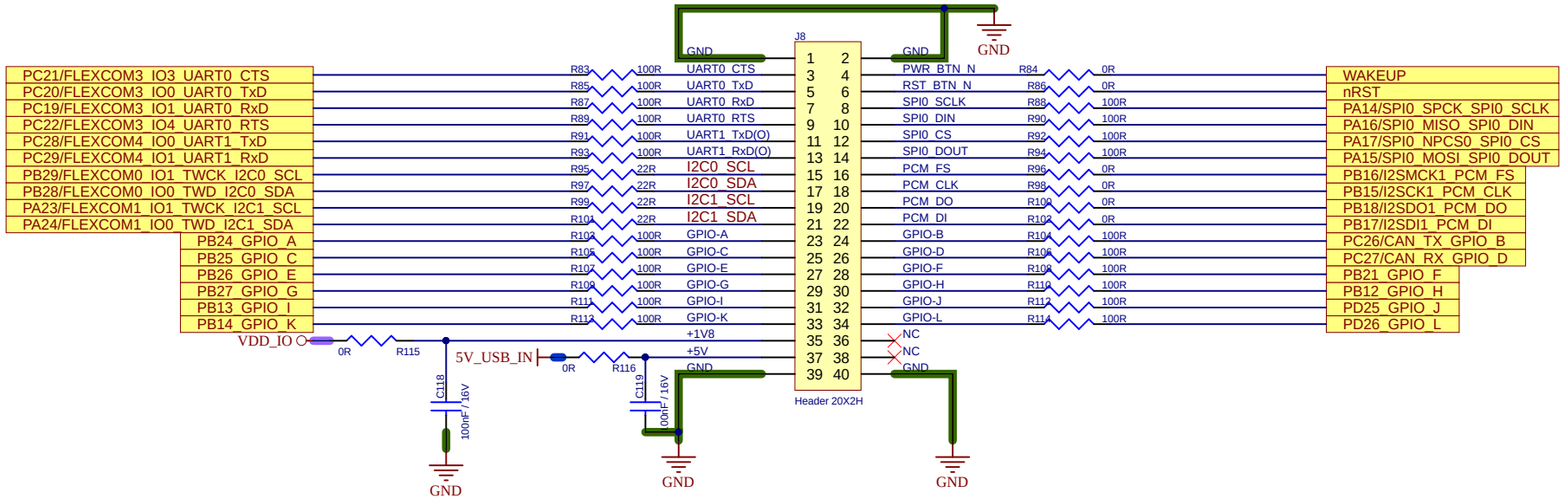
Status LEDs

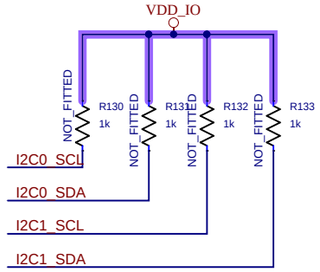
LED0: Power LED
LED1: User programmable
LED2: WIFI active
LED3: Bluetooth active
LED4: Zigbee active



NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet HMI		
	File Name: HD96_HMI.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:52		Blatt 14von 16

Low Speed Expansion Connector
96Boards IOT Edition 1,8V





NewTec System-Entwicklung und Beratung www.newtec.de	Product: NTSecureGateway HelmsDeep96		
	Sheet: Low Speed Expansion Connector		
	File Name: HD96_ExpansionConnecter.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
	Last Modification: 04.10.2019 17:46:52		Blatt 15von 16

Changes

Revison	Change Description	Date	Name
	Initial Revision	2018-05-22	AGV
V0.1	Replace MIC 2025 by MIC 2095 Add RC filter to MIC 2800 to implement power sequencing Add 100nF Capacitors close to DDR_VREF pins Mark R21 as not fitted mark R30, R31 as fitted (I2C pull-up) Change EN Pin Voltage Source to Vref2 Check U7 Pinout add pull-ups to WDO and IRQ on U10 Check VDDA and VDDIO wiring on U11 Check series resistor R49 for LAN LED Check VDDIO wiring on U13 Add pull up resistors for I2C on Expansion Connector Add Pullup to uSD card detect signal Add Separate LDO for VDDFUSE Change pinning for LEDs and SDMMC1_CD to keep comaptibility with industrial version	2018-09-21	AB
V1.2	Part No for NOR Flash corrected (-> 1V8 Version); Part No for WIFI Moudule updated to Version with integrated Antenna Add 0R for JTAGSEL to GND Connect Micro SD Card Detect to PA30 instead of PD23 Change Footprint of C123 to 0805 Connect Power Domains VDDISC and VDDSDHC to VDD_IO Correct Signal Naming of PA13_EN_WLAN_3V3 to PA09_EN_WLAN_3V3 Switch Power Source for LEDs from VDD_IO to VDD_3V3 Add CAN Signals to Mezzanine Connector, connect GPIO B to PC26/CANTX instead of PB19 and GPIO D to PC27/CANRX instead of PB20 Add Support for external VDDBU Change Part No. of J3 to lower profile type	2019-05-03	AB
V1.3	Add FET for switching LED on Ethernet Jack Fix Pullups on GPIOs to VDD_IO instead of VDD_3V3: PA27, PA07, PD19 Add Voltage Devider for PA29, but set R82 to DNP, because Wakeup button needs VDDBU. so Button can only be used as User Button OR Wakup button Fix Card Detect Fix double use of Flexcom3 on Expansion Connector: Use Flexcom1 on PA23/PA24 for I2C1 Fix Ethernet Oscilator Part No from DESC6011 to DESC1001 Fix EMC Problem on MIC2800: Add C134 parallel to C7 Add Pullups to I2C R138 and R139 Add C135 to VDDFuse Enable	2019-09-11	AB

NewTec
System-Entwicklung und Beratung
www.newtec.de

Product: NTSecureGateway HelmsDeep96		
Sheet Revision History		
File Name: HD96_RevisionHistory.SchDoc	Document Number: 11648_0008_0002_A-96Board	Revision: V 1.3
Last Modification: 04.10.2019 17:46:52		Blatt 16von 16