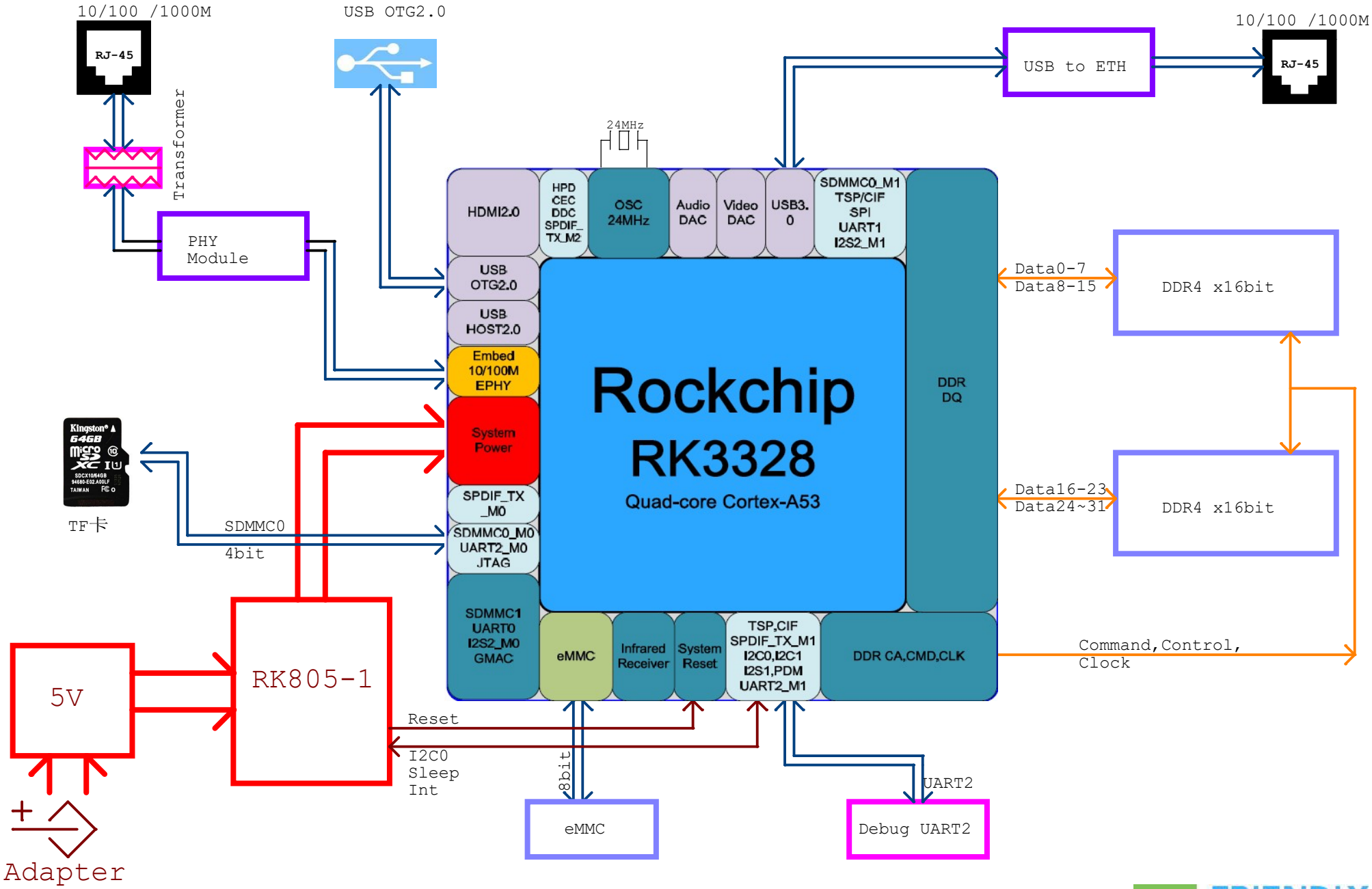
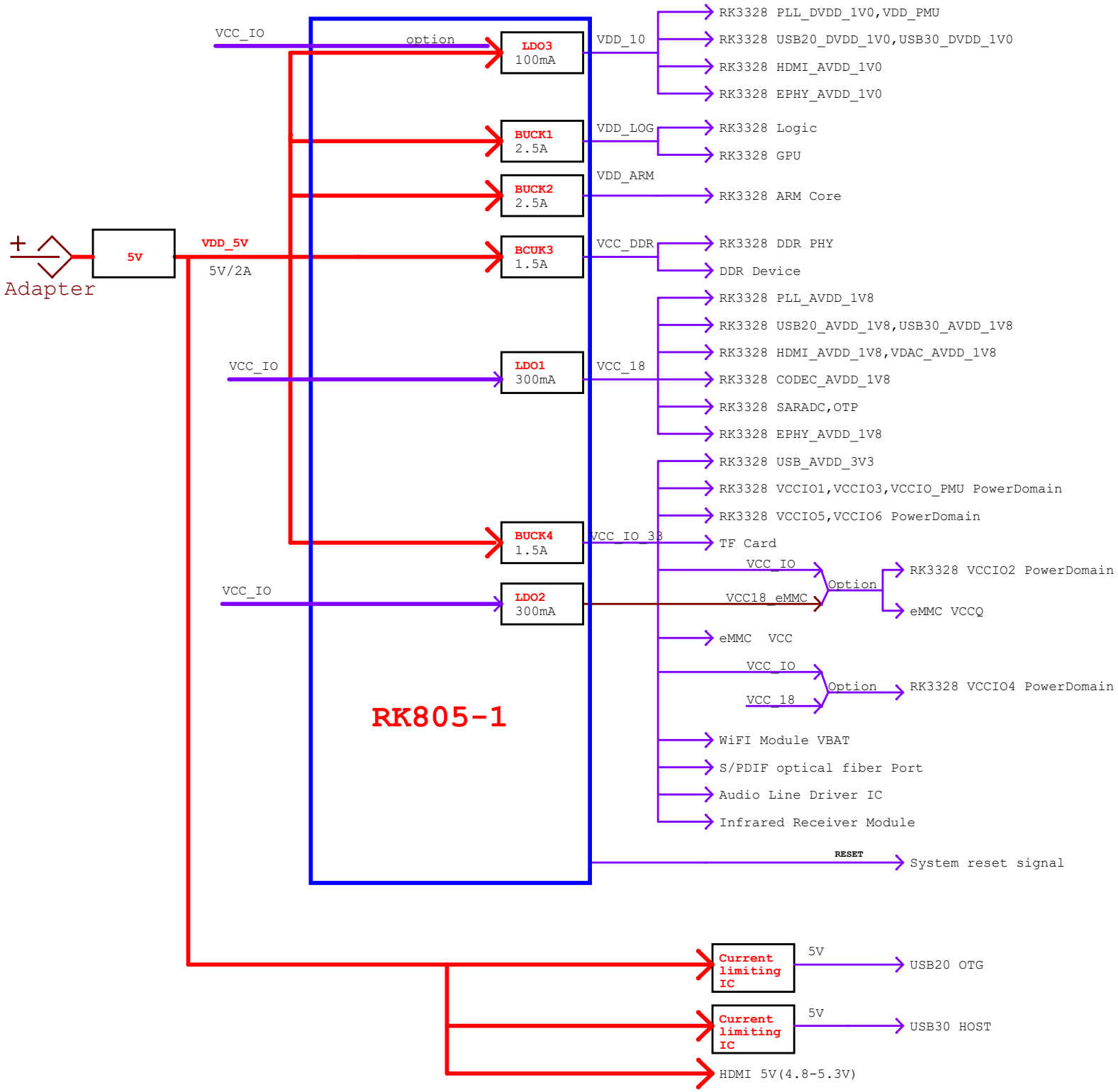


FRIENDLY ELEC

NanoPi R2S		
Size A3	Document Number Title	Rev 1912
Date: Tuesday, December 17, 2019	Sheet 1 of 14	



Power Timing

TYPE	VOLT	STEP	PowerName
BUCK1	1.1V		VDD_LOG
BUCK2	1.1V		VDD_ARM
BUCK3	FB=0.8V		VCC_DDR
BUCK4	3.3V		VCC_IO
LDO1	1.8V		VCC_18
LDO2	1.8V		VCC18_eMMC
LDO3	1.0V		VDD_10

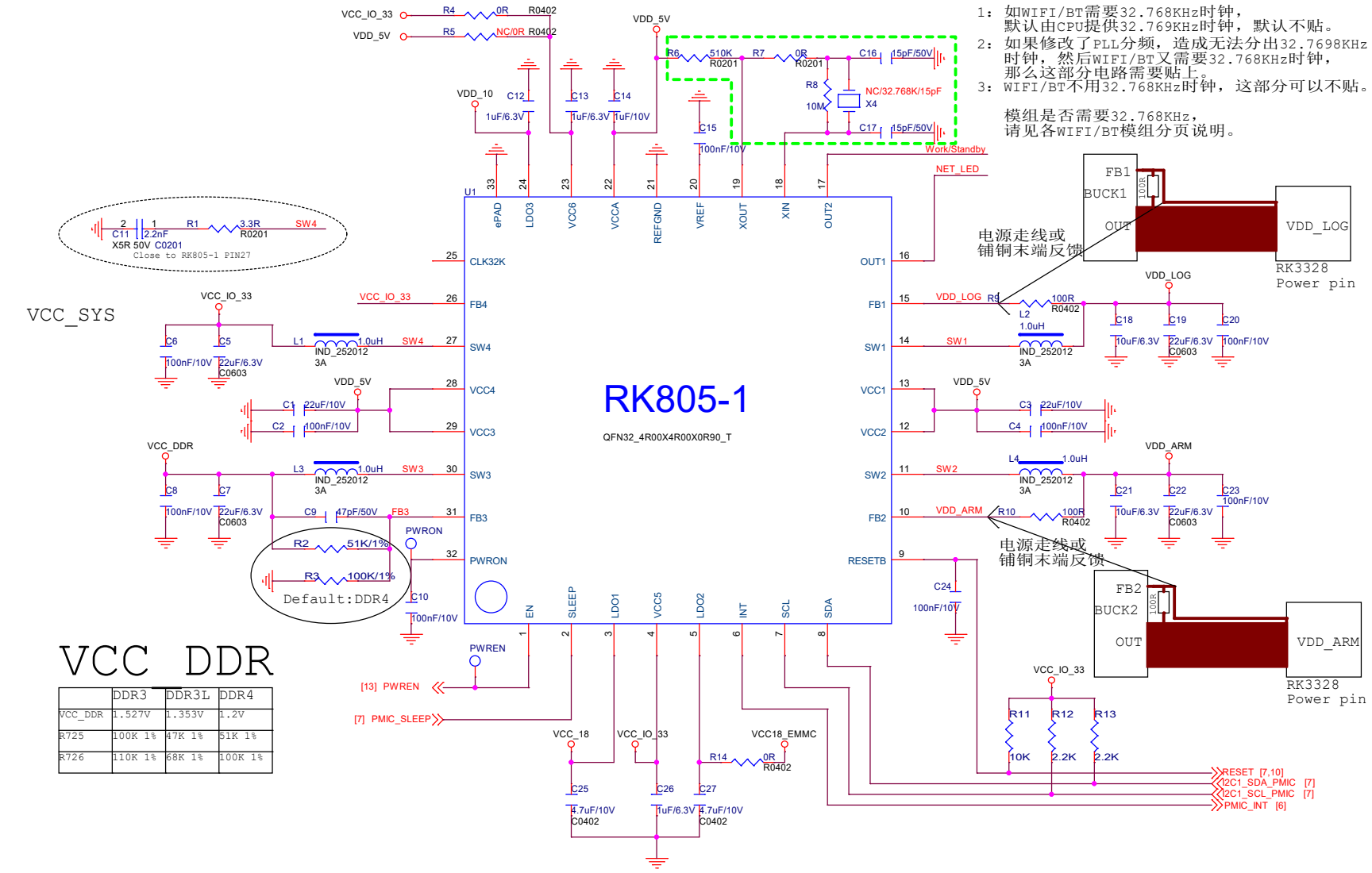
IO电源域电压	IO电压＝3.3V	IO电压＝1.8V
VCCIO_PMU	3.3V	不支持
VCCIO1	3.3V	不支持
VCCIO2		1.8V（默认） eMMC
VCCIO3	3.3V（默认）	
VCCIO4	3.3V（默认） WIFI:RTL8723BS	
VCCIO5	3.3V（默认）	
VCCIO6	3.3V（默认）	

FRIENDLY ELEC

NanoPi R2S

Size	Document Number	Rev
A2	02.Power tree-RK805-1	1912

Date: Tuesday, December 17, 2019 Sheet 2 of 14



	DDR3	DDR3L	DDR4
VCC_DDR	1.527V	1.353V	1.2V
R725	100K 1%	47K 1%	51K 1%
R726	110K 1%	68K 1%	100K 1%

GND GND

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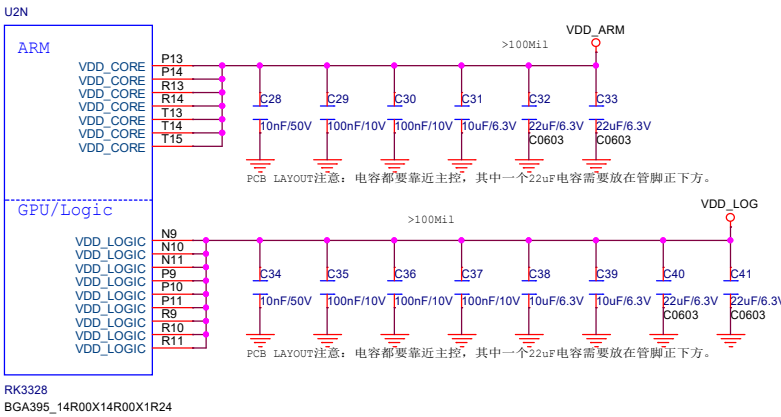
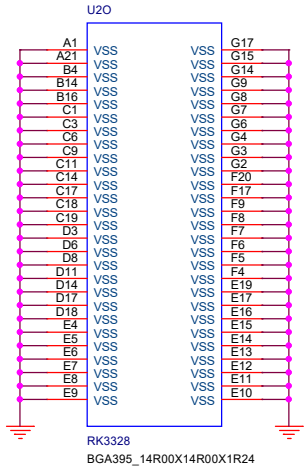
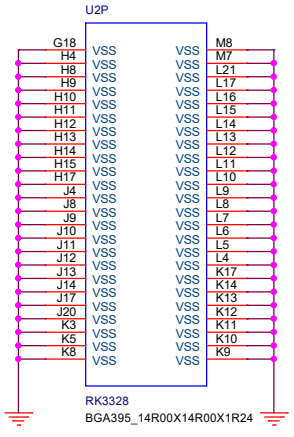
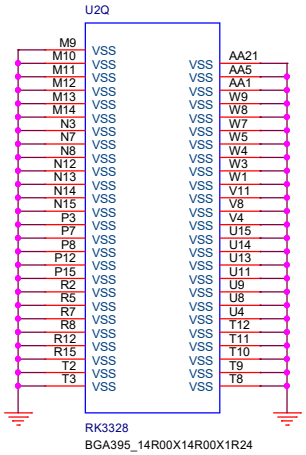
NanoPi R2S		
Size A3	Document Number 03.PMIC RK805-1	Rev 1912
Date: Tuesday, December 17, 2019	Sheet 3 of 14	

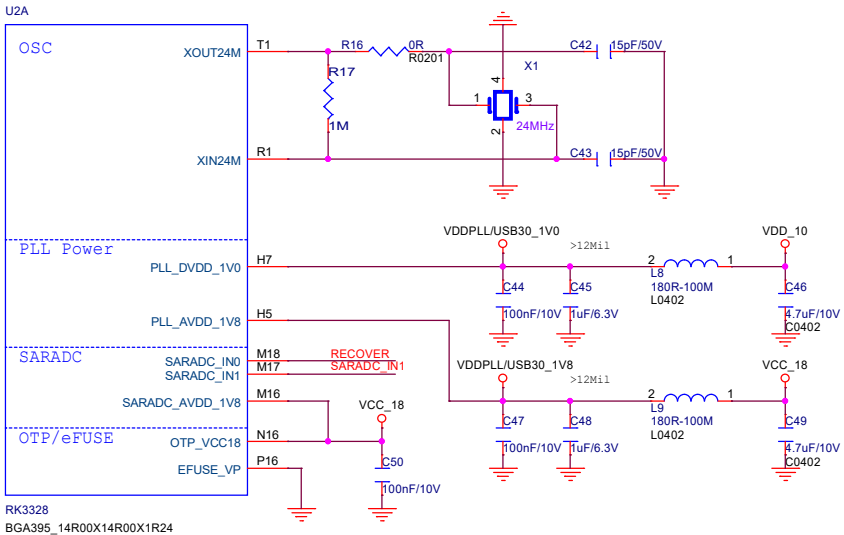


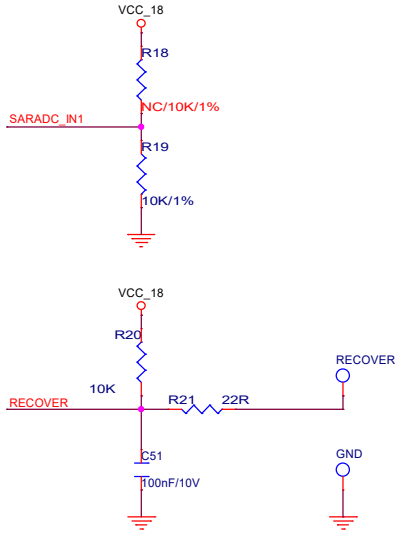






RK3328 OSC/PLL/OTP/SARADC





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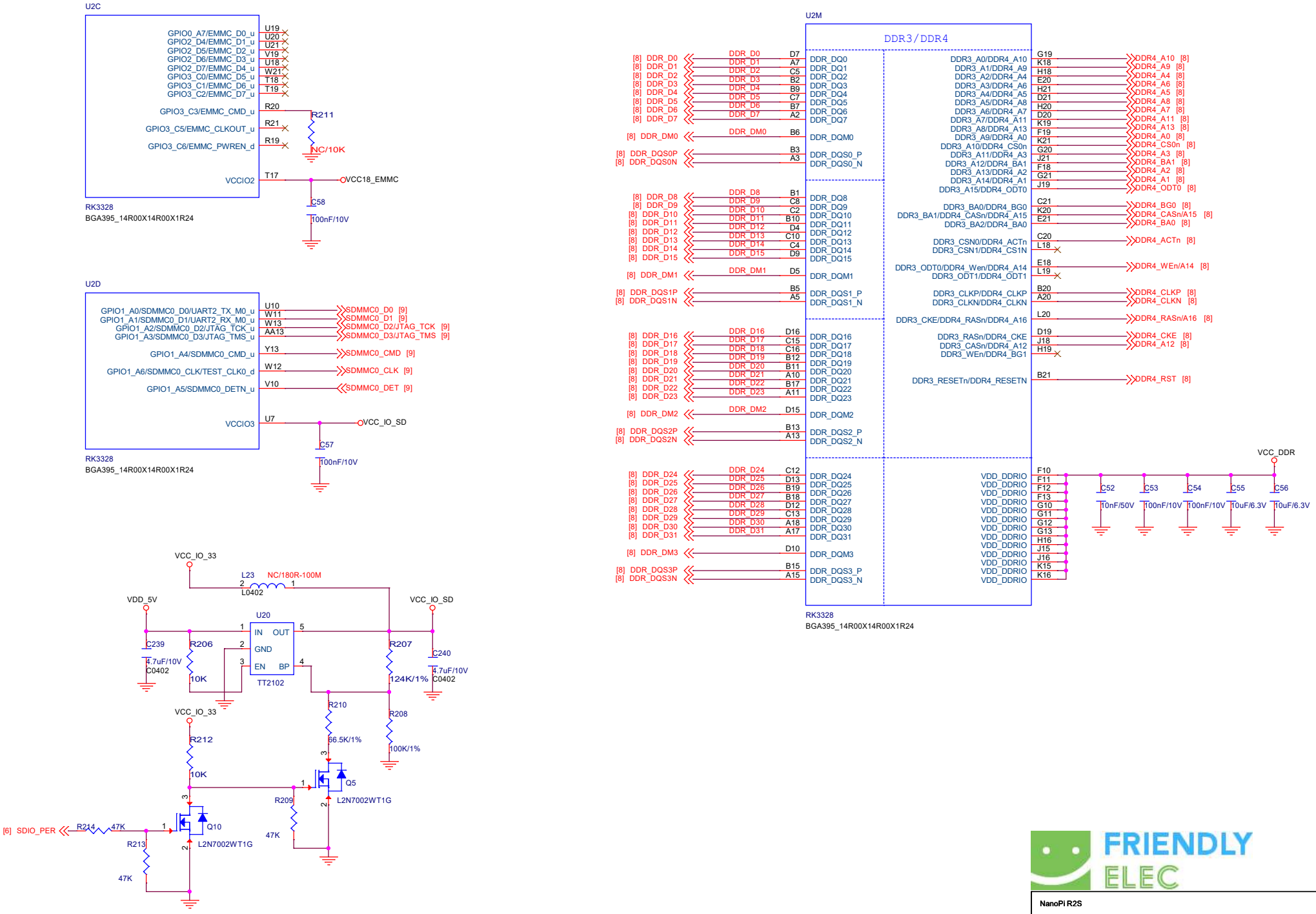
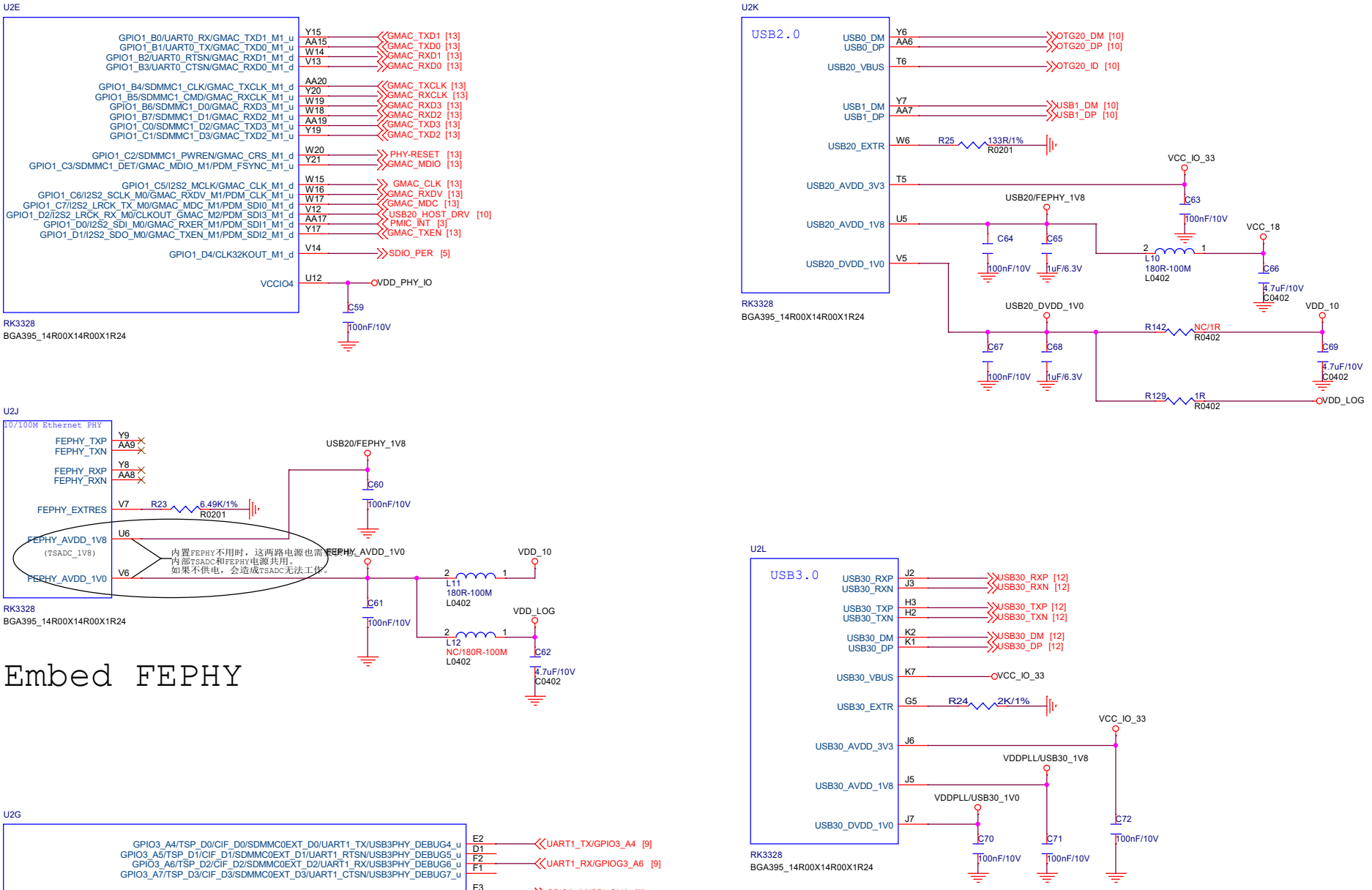
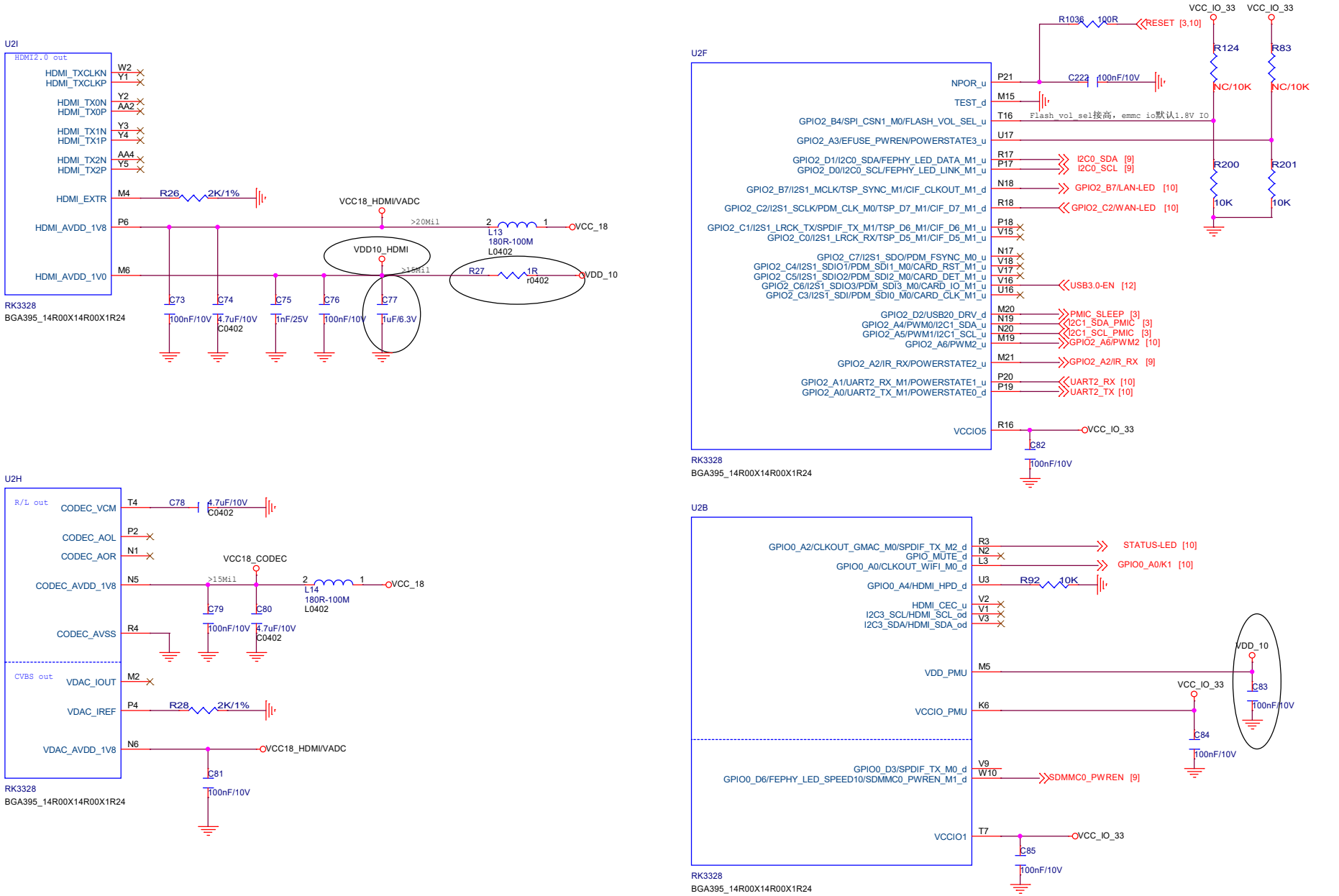
NanoPi R2S		
Size A3	Document Number 04.RK3328 Power	Rev 1912
Date: Tuesday, December 17, 2019	Sheet 4 of 14	

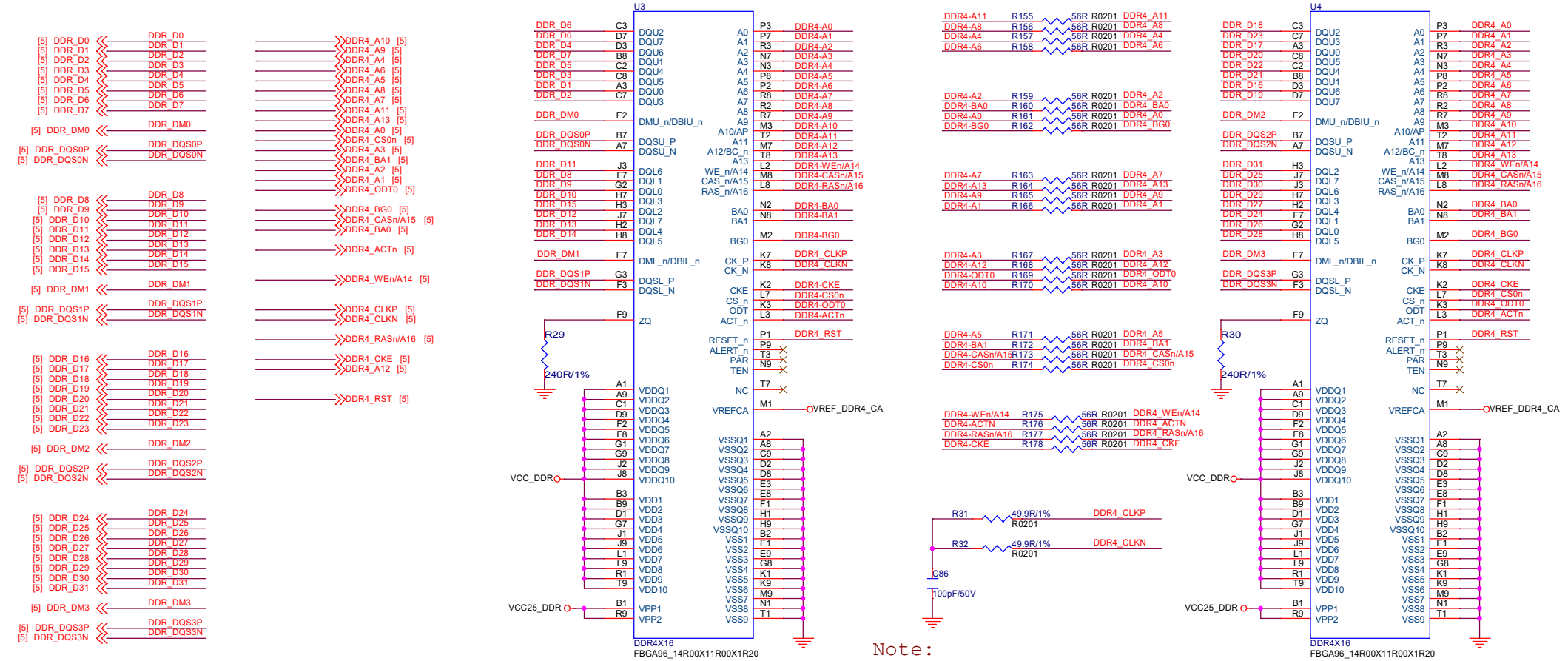

U2C
GPIO0_A7/EMMC_D0_u
GPIO2_D4/EMMC_D1_u
GPIO2_D5/EMMC_D2_u
GPIO2_D6/EMMC_D3_u
GPIO2_D7/EMMC_D4_u
GPIO3_C0/EMMC_D5_u
GPIO3_C1/EMMC_D6_u
GPIO3_C2/EMMC_D7_u
GPIO3_C3/EMMC_CMD_u
GPIO3_C5/EMMC_CLKOUT_u
GPIO3_C6/EMMC_PWREN_d
VCCIO2
R211
NC/10K
C58
100nF/10V
VCC18_EMMC
RK3328
BGA395_14R00X14R00X1R24
U2D
GPIO1_A0/SDMMC0_D0/UART2_TX_M0_u
GPIO1_A1/SDMMC0_D1/UART2_RX_M0_u
GPIO1_A2/SDMMC0_D2/JTAG_TCK_u
GPIO1_A3/SDMMC0_D3/JTAG_TMS_u
GPIO1_A4/SDMMC0_CMD_u
GPIO1_A6/SDMMC0_CLK/TEST_CLK0_d
GPIO1_A5/SDMMC0_DETN_u
VCCIO3
SDMMC0_D0 [9]
SDMMC0_D1 [9]
SDMMC0_D2/JTAG_TCK [9]
SDMMC0_D3/JTAG_TMS [9]
SDMMC0_CMD [9]
SDMMC0_CLK [9]
SDMMC0_DET [9]
VCC_IO_SD
C57
100nF/10V
RK3328
BGA395_14R00X14R00X1R24
U2M
DDR3/DDR4
DDR_DQ0
DDR_DQ1
DDR_DQ2
DDR_DQ3
DDR_DQ4
DDR_DQ5
DDR_DQ6
DDR_DQ7
DDR_DQM0
DDR_DQS0_P
DDR_DQS0_N
DDR_DQ8
DDR_DQ9
DDR_DQ10
DDR_DQ11
DDR_DQ12
DDR_DQ13
DDR_DQ14
DDR_DQ15
DDR_DQM1
DDR_DQS1_P
DDR_DQS1_N
DDR_DQ16
DDR_DQ17
DDR_DQ18
DDR_DQ19
DDR_DQ20
DDR_DQ21
DDR_DQ22
DDR_DQ23
DDR_DQM2
DDR_DQS2_P
DDR_DQS2_N
DDR_DQ24
DDR_DQ25
DDR_DQ26
DDR_DQ27
DDR_DQ28
DDR_DQ29
DDR_DQ30
DDR_DQ31
DDR_DQM3
DDR_DQS3_P
DDR_DQS3_N
DDR3_A0/DDR4_A10
DDR3_A1/DDR4_A9
DDR3_A2/DDR4_A4
DDR3_A3/DDR4_A6
DDR3_A4/DDR4_A5
DDR3_A5/DDR4_A8
DDR3_A6/DDR4_A7
DDR3_A7/DDR4_A11
DDR3_A8/DDR4_A13
DDR3_A9/DDR4_A0
DDR3_A10/DDR4_CS0n
DDR3_A11/DDR4_A3
DDR3_A12/DDR4_BA1
DDR3_A13/DDR4_A2
DDR3_A14/DDR4_A1
DDR3_A15/DDR4_ODT0
DDR3_BA0/DDR4_BG0
DDR3_BA1/DDR4_CASn/DDR4_A15
DDR3_BA2/DDR4_BA0
DDR3_CSN0/DDR4_ACTn
DDR3_CSN1/DDR4_CS1N
DDR3_ODT0/DDR4_Wen/DDR4_A14
DDR3_ODT1/DDR4_ODT1
DDR3_CLKP/DDR4_CLKP
DDR3_CLKN/DDR4_CLKN
DDR3_CKE/DDR4_RASn/DDR4_A16
DDR3_RASn/DDR4_CKE
DDR3_CASn/DDR4_A12
DDR3_WEn/DDR4_BG1
DDR3_RESETn/DDR4_RESETN
DDR4_A10 [8]
DDR4_A9 [8]
DDR4_A4 [8]
DDR4_A6 [8]
DDR4_A5 [8]
DDR4_A8 [8]
DDR4_A7 [8]
DDR4_A11 [8]
DDR4_A13 [8]
DDR4_A0 [8]
DDR4_CS0n [8]
DDR4_A3 [8]
DDR4_BA1 [8]
DDR4_A2 [8]
DDR4_A1 [8]
DDR4_ODT0 [8]
DDR4_BG0 [8]
DDR4_CASn/A15 [8]
DDR4_BA0 [8]
DDR4_ACTn [8]
DDR4_WEn/A14 [8]
DDR4_CLKP [8]
DDR4_CLKN [8]
DDR4_RASn/A16 [8]
DDR4_CKE [8]
DDR4_A12 [8]
DDR4_RST [8]
VDD_DDRIO
VCC_DDR
C52
C53
C54
C55
C56
10nF/50V
100nF/10V
100nF/10V
10uF/6.3V
10uF/6.3V
RK3328
BGA395_14R00X14R00X1R24
VCC_IO_33
L23
NC/180R-100M
L0402
VDD_5V
VCC_IO_SD
U20
IN
OUT
GND
EN
BP
TT2102
C239
4.7uF/10V
C0402
R206
10K
R207
124K/1%
C240
4.7uF/10V
C0402
R210
66.5K/1%
R208
100K/1%
R212
10K
Q5
L2N7002WT1G
R209
47K
Q10
L2N7002WT1G
R214
47K
R213
47K
[6] SDIO_PER
FRIENDLY ELEC
NanoPi R2S
Size A3
Document Number 05.DDR/eMMC/TF Controler
Rev 1912
Date: Tuesday, October 20, 2020
Sheet 5 of 14

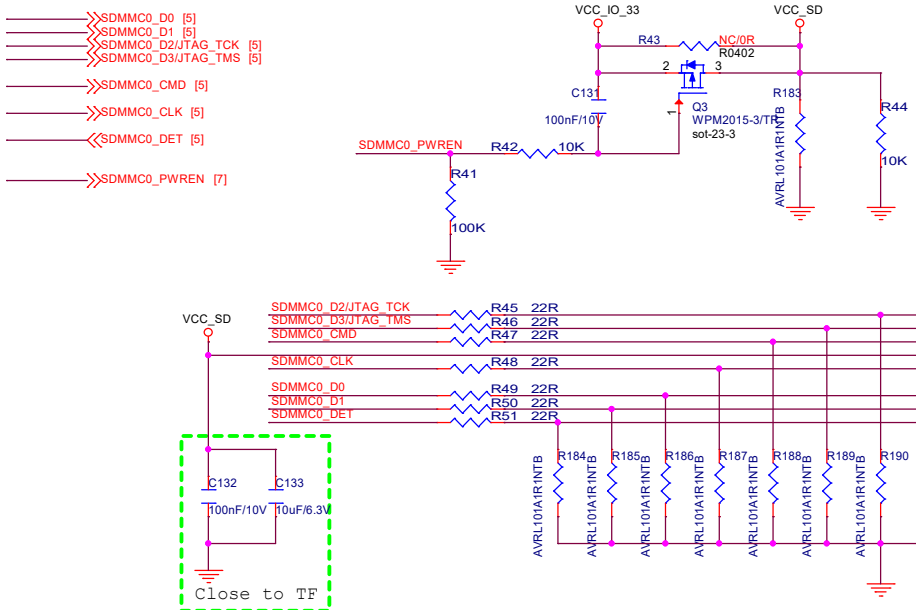

U2E
GPIO1_B0/UART0_RX/GMAC_TXD1_M1_u
GPIO1_B1/UART0_TX/GMAC_TXD0_M1_u
GPIO1_B2/UART0_RTSN/GMAC_RXD1_M1_d
GPIO1_B3/UART0_CTSN/GMAC_RXD0_M1_d
GPIO1_B4/SDMMC1_CLK/GMAC_TXCLK_M1_d
GPIO1_B5/SDMMC1_CMD/GMAC_RXCLK_M1_u
GPIO1_B6/SDMMC1_D0/GMAC_RXD3_M1_u
GPIO1_B7/SDMMC1_D1/GMAC_RXD2_M1_u
GPIO1_C0/SDMMC1_D2/GMAC_TXD3_M1_u
GPIO1_C1/SDMMC1_D3/GMAC_TXD2_M1_u
GPIO1_C2/SDMMC1_PWREN/GMAC_CRS_M1_d
GPIO1_C3/SDMMC1_DET/GMAC_MDIO_M1/PDM_FSYNC_M1_u
GPIO1_C5/I2S2_MCLK/GMAC_CLK_M1_d
GPIO1_C6/I2S2_SCLK_M0/GMAC_RXDV_M1/PDM_CLK_M1_u
GPIO1_C7/I2S2_LRCK_TX_M0/GMAC_MDC_M1/PDM_SDI0_M1_d
GPIO1_D2/I2S2_LRCK_RX_M0/CLKOUT_GMAC_M2/PDM_SDI3_M1_d
GPIO1_D0/I2S2_SDI_M0/GMAC_RXER_M1/PDM_SDI1_M1_d
GPIO1_D1/I2S2_SDO_M0/GMAC_TXEN_M1/PDM_SDI2_M1_d
GPIO1_D4/CLK32KOUT_M1_d
VCCIO4
Y15
AA15
W14
V13
AA20
Y20
W19
W18
AA19
Y19
W20
Y21
W15
W16
W17
V12
AA17
Y17
V14
U12
GMAC_TXD1 [13]
GMAC_TXD0 [13]
GMAC_RXD1 [13]
GMAC_RXD0 [13]
GMAC_TXCLK [13]
GMAC_RXCLK [13]
GMAC_RXD3 [13]
GMAC_RXD2 [13]
GMAC_TXD3 [13]
GMAC_TXD2 [13]
PHY-RESET [13]
GMAC_MDIO [13]
GMAC_CLK [13]
GMAC_RXDV [13]
GMAC_MDC [13]
USB20_HOST_DRV [10]
PMIC_INT [3]
GMAC_TXEN [13]
SDIO_PER [5]
VDD_PHY_IO
C59
100nF/10V
RK3328
BGA395_14R00X14R00X1R24
U2K
USB2.0
USB0_DM
USB0_DP
USB20_VBUS
USB1_DM
USB1_DP
USB20_EXTR
USB20_AVDD_3V3
USB20_AVDD_1V8
USB20_DVDD_1V0
Y6
AA6
T6
Y7
AA7
W6
T5
U5
V5
OTG20_DM [10]
OTG20_DP [10]
OTG20_ID [10]
USB1_DM [10]
USB1_DP [10]
R25
133R/1%
R0201
VCC_IO_33
C63
100nF/10V
USB20/FEPHY_1V8
C64
100nF/10V
C65
1uF/6.3V
VCC_18
L10
180R-100M
L0402
C66
4.7uF/10V
C0402
USB20_DVDD_1V0
C67
100nF/10V
C68
1uF/6.3V
R142
NC/1R
R0402
VDD_10
C69
4.7uF/10V
C0402
R129
1R
R0402
VDD_LOG
RK3328
BGA395_14R00X14R00X1R24
U2J
10/100M Ethernet PHY
FEPHY_TXP
FEPHY_TXN
FEPHY_RXP
FEPHY_RXN
FEPHY_EXTRES
FEPHY_AVDD_1V8
(TSADC_1V8)
FEPHY_AVDD_1V0
Y9
AA9
Y8
AA8
V7
U6
V6
R23
6.49K/1%
R0201
USB20/FEPHY_1V8
C60
100nF/10V
内置FEPHY不用时，这两路电源也需要供电，
内部TSADC和FEPHY电源共用，
如果不供电，会造成TSADC无法工作。
FEPHY_AVDD_1V0
C61
100nF/10V
VDD_10
L11
180R-100M
L0402
VDD_LOG
L12
NC/180R-100M
L0402
C62
4.7uF/10V
C0402
RK3328
BGA395_14R00X14R00X1R24
Embed FEPHY
U2L
USB3.0
USB30_RXP
USB30_RXN
USB30_TXP
USB30_TXN
USB30_DM
USB30_DP
USB30_VBUS
USB30_EXTR
USB30_AVDD_3V3
USB30_AVDD_1V8
USB30_DVDD_1V0
J2
J3
H3
H2
K2
K1
K7
G5
J6
J5
J7
USB30_RXP [12]
USB30_RXN [12]
USB30_TXP [12]
USB30_TXN [12]
USB30_DM [12]
USB30_DP [12]
VCC_IO_33
R24
2K/1%
VCC_IO_33
VDDPLL/USB30_1V8
VDDPLL/USB30_1V0
C70
100nF/10V
C71
100nF/10V
C72
100nF/10V
RK3328
BGA395_14R00X14R00X1R24
U2G
GPIO3_A4/TSP_D0/CIF_D0/SDMMC0EXT_D0/UART1_TX/USB3PHY_DEBUG4_u
GPIO3_A5/TSP_D1/CIF_D1/SDMMC0EXT_D1/UART1_RTSN/USB3PHY_DEBUG5_u
GPIO3_A6/TSP_D2/CIF_D2/SDMMC0EXT_D2/UART1_RX/USB3PHY_DEBUG6_u
GPIO3_A7/TSP_D3/CIF_D3/SDMMC0EXT_D3/UART1_CTSN/USB3PHY_DEBUG7_u
GPIO3_A0/TSP_VALID/CIF_VSYNC/SDMMC0EXT_CMD/SPI_CLK_M2/USB3PHY_DEBUG1/I2S2_SCLK_M1_u
GPIO3_A2/TSP_CLK/CIF_CLKIN/SDMMC0EXT_CLK/SPI_RXD_M2/USB3PHY_DEBUG3/I2S2_SDI_M1_d
GPIO3_A1/TSP_FAIL/CIF_HREF/SDMMC0EXT_DET/SPI_TXD_M2/USB3PHY_DEBUG2/I2S2_SDO_M1_u
GPIO3_B0/TSP_D4/CIF_D4/SPI_CSN0_M2/I2S2_LRCK_TX_M1/USB3PHY_DEBUG8/I2S2_LRCK_RX_M1_d
VCCIO6
E2
D1
F2
F1
E3
E1
D2
F3
H6
UART1_TX/GPIO3_A4 [9]
UART1_RX/GPIOG3_A6 [9]
GPIO3_A0/SPI_CLK [9]
GPIO3_A2/SPI-RXD [9]
GPIO3_A1/SPI-TXD [9]
GPIO3_B0/SPI_CSN0 [9]
VCC_IO_33
RK3328
BGA395_14R00X14R00X1R24
FRIENDLY ELEC
NanoPi R2S
Size A3
Document Number 06.FLASH/TF/USB Controler
Rev 1912
Date: Tuesday, December 17, 2019
Sheet 6 of 14



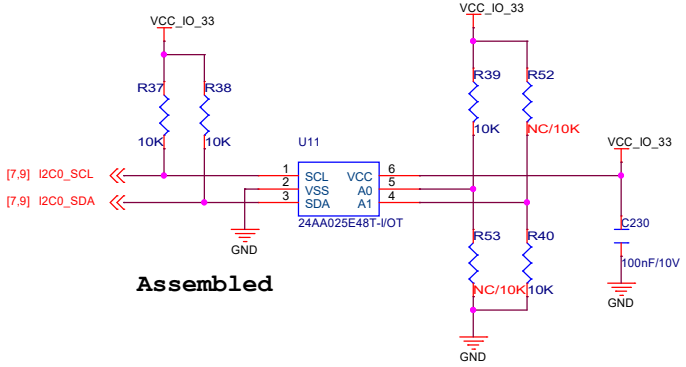
FRIENDLY ELEC

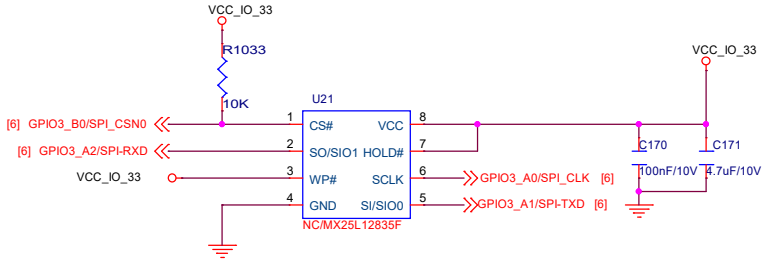
NanoPi R2S		
Size A3	Document Number 07.HDMI/AV/EPHY/GPIO Controler	Rev 1912
Date: Monday, September 21, 2020	Sheet 7 of 14	


U3
U4
DDR4X16
FBGA96_14R00X11R00X1R20
2X16bit DDR4
Note:
DDR4 Speed > =2133Mb/s
4 layer board
VCC_DDR
VCC25_DDR
VDD_5V
VREF_DDR4_CA
U8
RT9193-25PU5/2.5V
NanoPi R2S
Size A3
Document Number 08.RAM DDR4 2x16bit
Rev 1912
Date: Tuesday, December 17, 2019
Sheet 8 of 14



EEPROM with MAC Address

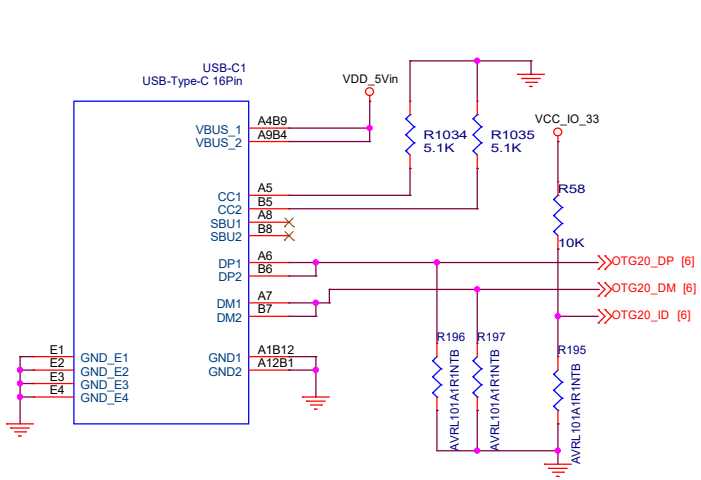


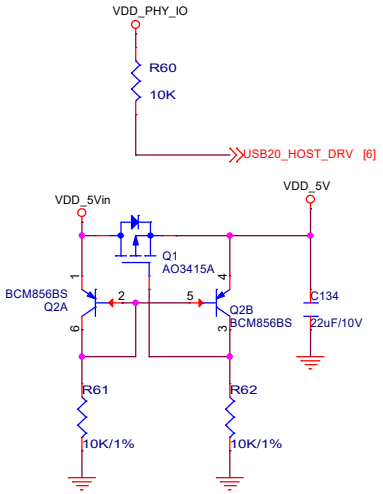


FRIENDLY ELEC

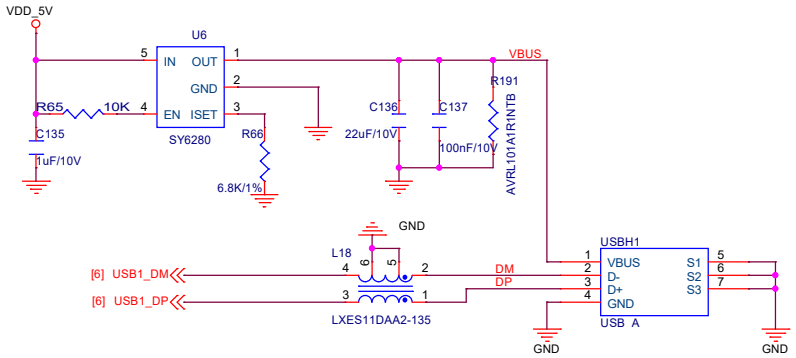
NanoPi R2S		
Size A3	Document Number 09.TF/SD Card	Rev 1912
Date: Tuesday, December 17, 2019	Sheet 9 of 14	

MicroUSB:PWR and Slave

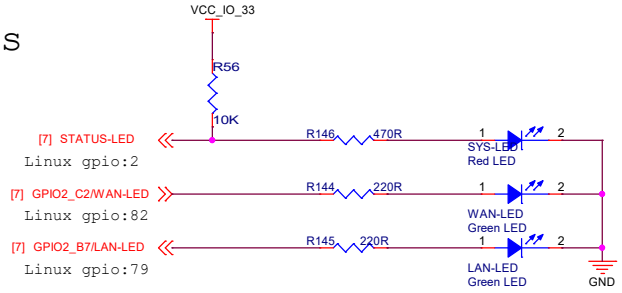




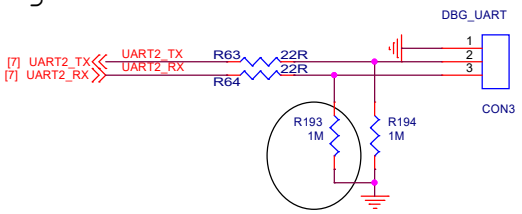
USB Host



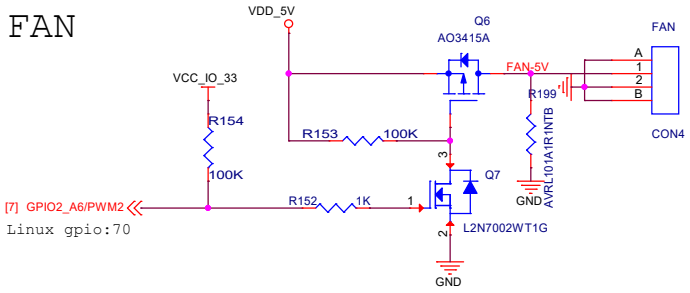
LEDs



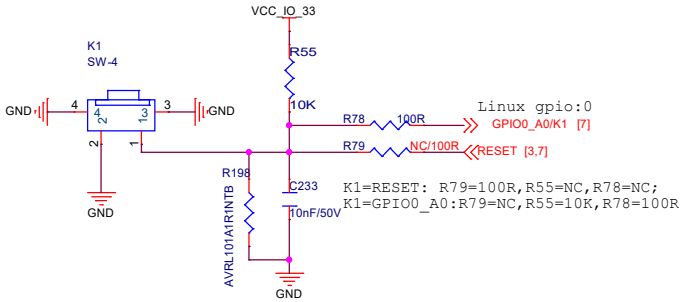
Debug UART2



FAN



KEY



FRIENDLY ELEC

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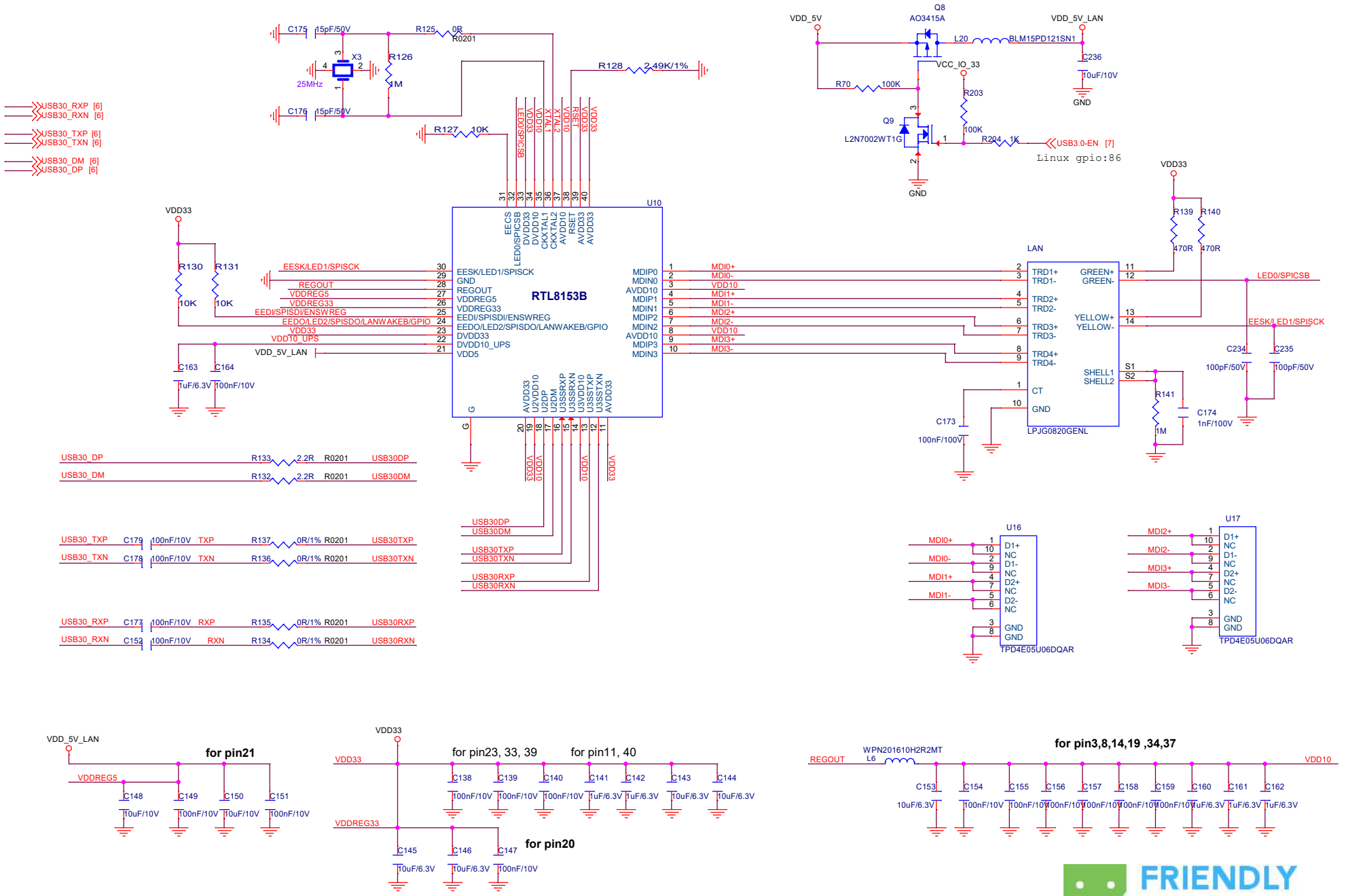

FRIENDLY ELEC

NanoPi R2S		
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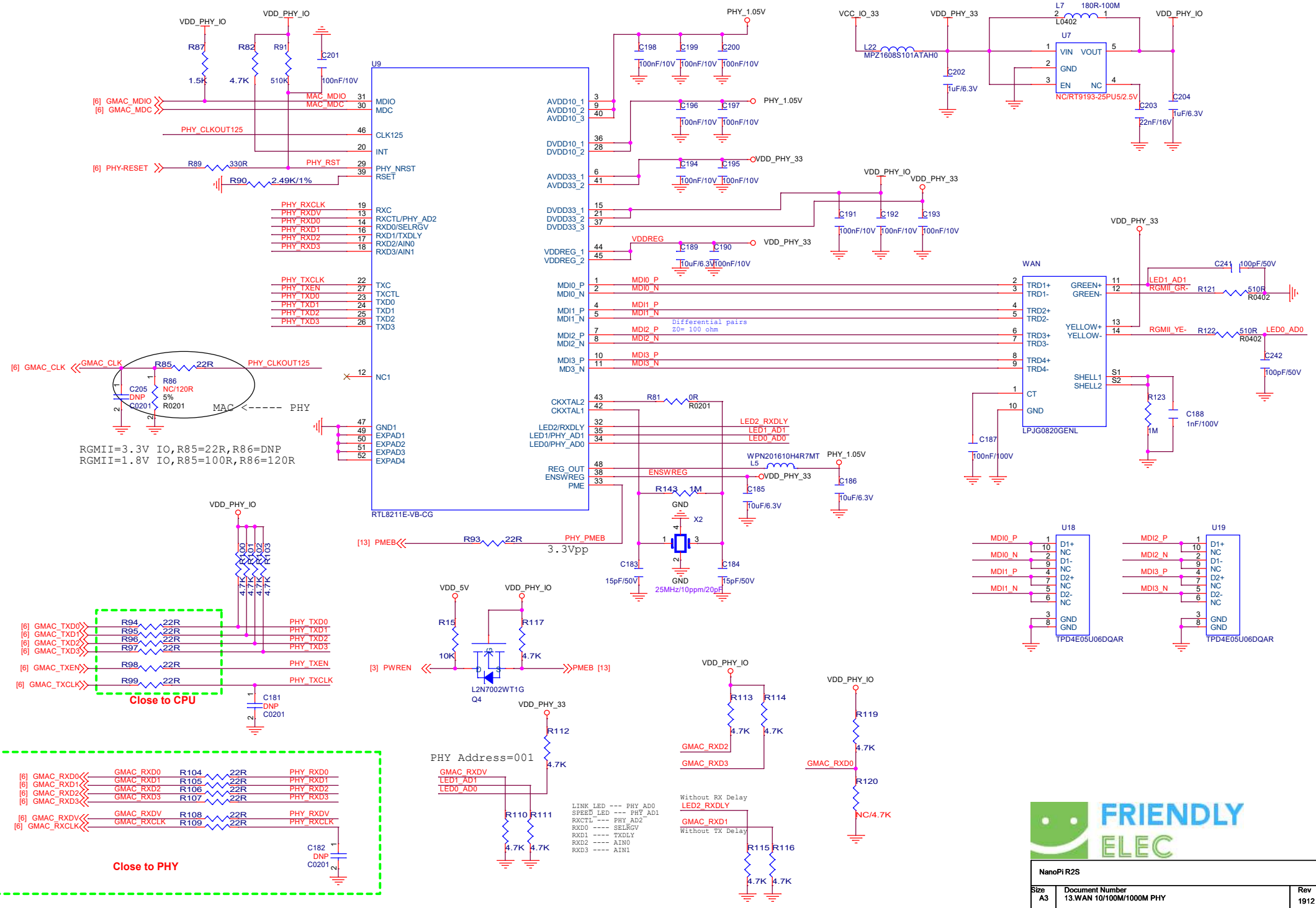
U9
RTL8211E-VB-CG
MDIO
MDC
CLK125
INT
PHY_NRST
RSET
RXC
RXCTL/PHY_AD2
RXD0/SELRGV
RXD1/TXDLY
RXD2/AIN0
RXD3/AIN1
TXC
TXCTL
TXD0
TXD1
TXD2
TXD3
NC1
GND1
EXPAD1
EXPAD2
EXPAD3
EXPAD4
MDI0_P
MDI0_N
MDI1_P
MDI1_N
MDI2_P
MDI2_N
MDI3_P
MDI3_N
Differential pairs
Z0= 100 ohm
CKXTAL2
CKXTAL1
LED2/RXDLY
LED1/PHY_AD1
LED0/PHY_AD0
REG_OUT
ENSWREG
PME
VDD_PHY_IO
VDD_PHY_33
PHY_1.05V
VDDREG
WAN
LPJG0820GENL
TRD1+
TRD1-
TRD2+
TRD2-
TRD3+
TRD3-
TRD4+
TRD4-
GREEN+
GREEN-
YELLOW+
YELLOW-
SHELL1
SHELL2
CT
GND
LED1_AD1
RGMII_GR-
RGMII_YE-
LED0_AD0
U18
U19
TPD4E05U06DQAR
D1+
D1-
D2+
D2-
NC
GND
L7
180R-100M
L0402
U7
VIN
VOUT
EN
NC/RT9193-25PU5/2.5V
L22
MPZ1608S101ATAH0
WPN201610H4R7MT
L5
X2
25MHz/10ppm/20pF
L2N7002WT1G
Q4
[6] GMAC_MDIO
[6] GMAC_MDC
[6] PHY-RESET
[6] GMAC_CLK
[6] GMAC_TXD0
[6] GMAC_TXD1
[6] GMAC_TXD2
[6] GMAC_TXD3
[6] GMAC_TXEN
[6] GMAC_TXCLK
[6] GMAC_RXD0
[6] GMAC_RXD1
[6] GMAC_RXD2
[6] GMAC_RXD3
[6] GMAC_RXDV
[6] GMAC_RXCLK
[13] PMEB
[3] PWREN
Close to CPU
Close to PHY
MAC <----- PHY
3.3Vpp
PHY Address=001
RGMII=3.3V IO,R85=22R,R86=DNP
RGMII=1.8V IO,R85=100R,R86=120R
LINK_LED --- PHY_AD0
SPEED_LED --- PHY_AD1
RXCTL ---- PHY_AD2
RXD0 ---- SELRGV
RXD1 ---- TXDLY
RXD2 ---- AIN0
RXD3 ---- AIN1
Without RX Delay
Without TX Delay
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