

## ARM® ARM926EL-S Based 32-bit Microprocessor

# NuDesign NK-980ETH2P User Manual NUC980DK61Y

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[www.nuvoton.com](http://www.nuvoton.com)

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## 1 OVERVIEW

nuvoTon's NuDesign NK-980ETH2P demo board is a specific development tool based on nuvoTon's NUC980DK61Y to provide customers with a low cost and ease of development. It can be easily customized for customers to provide their own UART-to-Ethernet device server products.

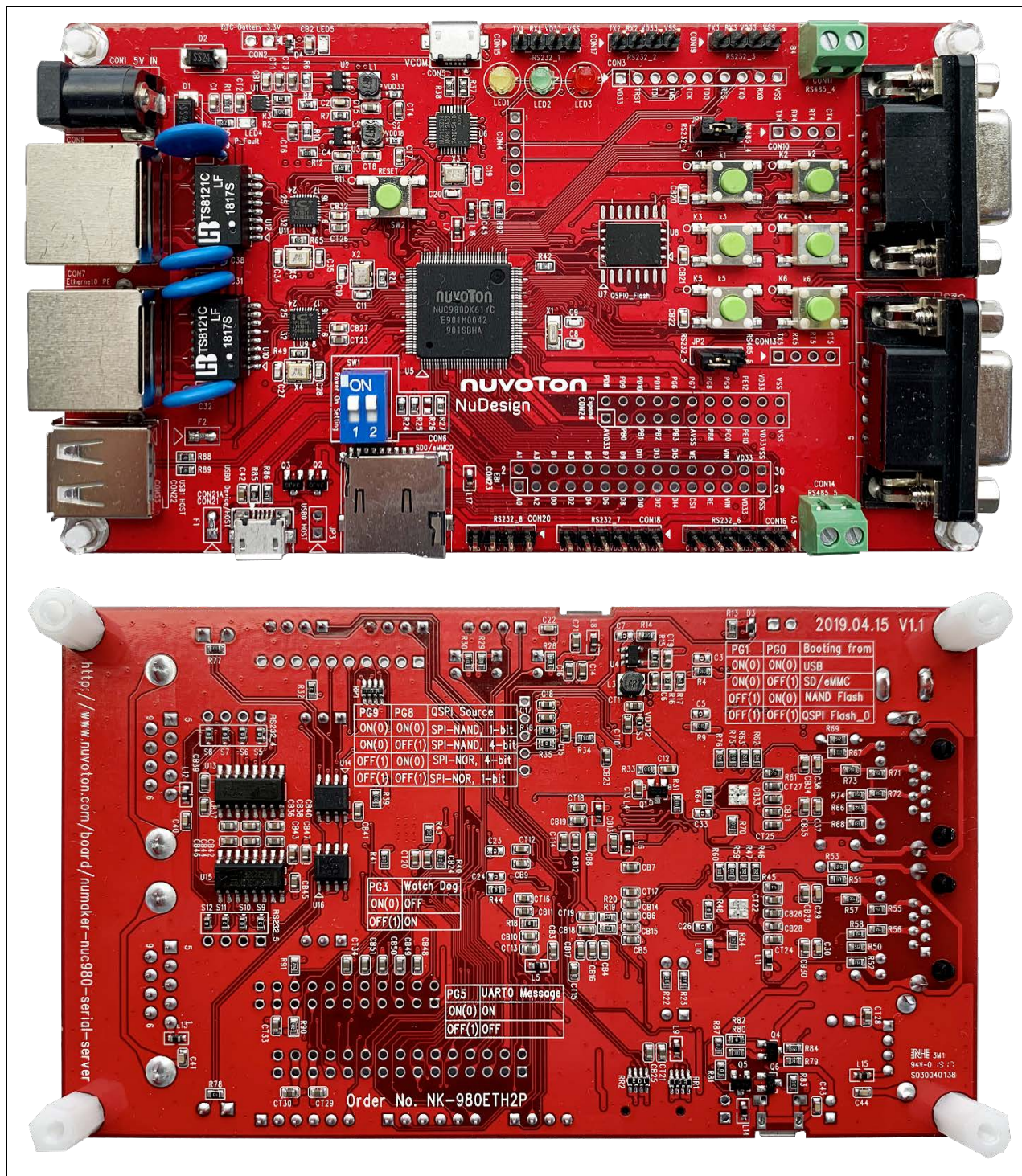


Figure 1-1 NuDesign NK-980ETH2P Demo Board



## 2 INTRODUCTION TO NUDESIGN NK-980ETH2P DEMO BOARD

The NuDesign NK-980ETH2P demo board uses NUC980DK61Y microprocessor run up to 300 MHz with built-in 64MB DDR2 memory, 16 KB I-cache, 16 KB D-cache and MMU, 16 KB embedded SRAM and 16.5 KB IBR (Internal Boot ROM) for system booting from USB, NAND flash, SD/eMMC and SPI Flash.

The NuDesign NK-980ETH2P demo board includes two sets of RS232/RS485 transceiver UART ports and six sets of pin header UART ports and two sets of 10/100Mbps Ethernet ports for network connection.

### 2.1 NuDesign NK-980ETH2P Demo Board Features

- NUC980DK61Y: LQFP128 pin MCP package with DDR2 (64 MB), which can run up to 300MHz operating speed
- SPI Flash: Quad mode system booting or data storage
- SD0/eMMC0: User SD/eMMC memory card for system booting, data storage or SDIO (Wi-Fi) device
- Provides 9 sets of COM ports
  - UART0: Connected to Virtual COM port for system development, debug message output
  - UART4/UART5: 2 sets of DB9 port with RS232 transceiver
  - UART1~3/UART6~8: 6 sets of pin headers
- JTAG interface provided for software development
- 2 sets of RJ45 port with Ethernet 10/100Mbps MAC
- 3 sets of LED for status indication
- 6 sets of user-configurable push button keys
- USB port-0 that can be used as Device/HOST and USB port-1 that can be used as HOST  
Supports pen drives, keyboards, mouse and printers
- Provides over-voltage and over current protection
- 3.3V I/O power, 1.8V Memory power and 1.2V core power

### 2.2 NuDesign NK-980ETH2P Demo Board – Front View

Figure 2-1 shows the main components from the front view of NuDesign NK-980ETH2P demo board

- +5V In (CON1): Power adaptor 5V input

Power Model	CON5 USB Port (Micro-B)	CON21 USB Port (Micro-B)	CON1
Model 1	Connect to PC	-	-
Model 2	-	Connect to PC	-
Model 3	-	-	VDD5V Input

- Power indication LEDs (LED4, LED5):

LED	Color	Descriptions
LED4	Red	The system power will be terminated and LED4 lighting when the input voltage is over 5.7V or the current is over 1.7A.
LED5	Green	Power normal state.

- RTC Battery (CON2): External Battery supply for RTC 3.3V powered
  - CON2.1: Positive (+)
  - CON2.2: Negative (-)
- System Reset (SW2): System will be reset if the SW2 button is pressed
- Virtual COM (CON5, U6): NUC123ZD4AN0 microcontroller (U6), USB micro-B connector (CON5) to PC, for debug message output
- User indication LEDs (LED1, LED2, LED3):

LED	Color	GPIO pin of NUC980
LED1	Yellow	GPG15
LED2	Green	GPB13
LED3	Red	GPF10

- UART1 pin header (CON15)

Connector	GPIO pin of NUC980	Function
CON15.1	GPA1	UART1_TXD
CON15.2	GPA0	UART1_RXD
CON15.3	-	VDD33
CON15.4	-	VSS

- QSPI0 Flash (U7, U8): Use Winbond W25N01GVZE1G 128 MB SPI-NAND (U7) for system booting, only one (U7 or U8) SPI Flash can be used, support dual / quad mode
- UART2 pin header (CON17)

Connector	GPIO pin of NUC980	Function
CON17.1	GPA10	UART2_TXD
CON17.2	GPA9	UART2_RXD
CON17.3	-	VDD33
CON17.4	-	VSS

- UART3 pin header (CON19).

Connector	GPIO pin of NUC980	Function
CON19.1	GPC3	UART3_TXD
CON19.2	GPC4	UART3_RXD
CON19.3	-	VDD33
CON19.4	-	VSS

- JTAG interface and UART0 (CON3)

Connector	GPIO pin of NUC980	Function
CON3.1	-	VDD33
CON3.2	GPG15	nTRST
CON3.3	GPG14	TDI
CON3.4	GPG13	TMS
CON3.5	GPG12	TCK
CON3.6	GPG11	TDO
CON3.7	-	nRESET
CON3.8	GPF12	UART0_TXD
CON3.9	GPF11	UART0_RXD
CON3.10	-	VSS

- UART4 selection (CON9, CON11, JP1):

- JP1: 1-2 short for RS232 function with RS232 transceiver, and RS232 connected DB9 female (CON9)
- JP1: 2-3 short for RS485 function with RS485 transceiver, and RS485 connected to 2P terminal (CON11)

Function	GPIO pin of NUC980
UART4_232_TXD/485_D	GPD12
UART4_232_RXD/485_R	GPD13
UART4_232_RTS/485_(/RE&DE)	GPD14
UART4_232_CTS	GPD15

- User Key Matrix SWs (K1~K6)

Key	Function	GPIO pin of NUC980
K1	Row0	GPC13
	Column0	GPC1
K2	Row0	GPC13
	Column1	GPC2
K3	Row1	GPC14
	Column0	GPC1
K4	Row1	GPC14
	Column1	GPC2
K5	Row2	GPC15
	Column0	GPC1
K6	Row2	GPC15
	Column1	GPC2

- UART5 selection (CON12, CON14, JP2):

- JP2: 1-2 short for RS232 function with RS232 transceiver, and RS232 connected DB9 female (CON12)
- JP2: 2-3 short for RS485 function with RS485 transceiver, and RS485 connected to 2P terminal (CON14)

Function	GPIO pin of NUC980
UART5_232_TXD/485_D	GPG14
UART5_232_RXD/485_R	GPG13
UART5_232_RTS/485_(/RE&DE)	GPG12
UART5_232_CTS	GPG11

- UART6 pin header (CON16)

Connector	GPIO pin of NUC980	Function
CON16.1	GPA5	UART6_TXD
CON16.2	GPA4	UART6_RXD
CON16.3	-	VDD33
CON16.4	-	VSS
CON16.5	GPA3	UART6_RTS
CON16.6	GPA2	UART6_CTS

- Expand port for user use (CON24)

Connector	GPIO pin of NUN980	Function
CON24.1	-	ADC VSS
CON24.2	GPD8	SPI0_SS0
CON24.3	GPB0	ADC_AIN[0]
CON24.4	GPD9	SPI0_CLK
CON24.5	GPB1	ADC_AIN[1]
CON24.6	GPD10	SPI0_DO
CON24.7	GPB2	ADC_AIN[2]
CON24.8	GPD11	SPI0_DI
CON24.9	GPB3	ADC_AIN[3]
CON24.10	GPG6	PWM10
CON24.11	-	ADC VDD33
CON24.12	GPG7	PWM11
CON24.13	GPB8	CAN2_RXD
CON24.14	GPG8	PWM12
CON24.15	GPC0	CAN2_TXD
CON24.16	GPG9	PWM13
CON24.17	GPE10	I2C0_SDA
CON24.18	GPE12	I2C0_SCL
CON24.19	-	VDD33
CON24.20	-	VDD33
CON24.21	-	VSS
CON24.22	-	VSS

- UART7 pin header (CON18)

Connector	GPIO pin of NUC980	Function
CON18.1	GPB6	UART7_TXD
CON18.2	GPB4	UART7_RXD
CON18.3	-	VDD33
CON18.4	-	VSS
CON18.5	GPB5	UART7_RTS
CON18.6	GPB7	UART7_CTS



- EBI port for user use (CON23)

Connector	GPIO pin of NUN980	Function
CON23.1	GPG0	EBI_ADDR0
CON23.2	GPG1	EBI_ADDR1
CON23.3	GPB2	EBI_ADDR2
CON23.4	GPG3	EBI_ADDR3
CON23.5	GPC0	EBI_DATA0
CON23.6	GPC1	EBI_DATA1
CON23.7	GPC2	EBI_DATA2
CON23.8	GPC3	EBI_DATA3
CON23.9	GPC4	EBI_DATA4
CON23.10	GPC5	EBI_DATA5
CON23.11	GPC6	EBI_DATA6
CON23.12	GPC7	EBI_DATA7
CON23.13	GPC8	EBI_DATA8
CON23.14	GPC9	EBI_DATA9
CON23.15	GPC10	EBI_DATA10
CON23.16	GPC11	EBI_DATA11
CON23.17	GPC12	EBI_DATA12
CON23.18	GPC13	EBI_DATA13
CON23.19	GPC14	EBI_DATA14
CON23.20	GPC15	EBI_DATA15
CON23.21	GPA6	EBI_nCS1
CON23.22	GPA7	EBI_nWE
CON23.23	GPA8	EBI_nRE
CON23.24	-	-
CON23.25	-	VIN
CON23.26	-	VIN
CON23.27	-	VDD33
CON23.28	-	VDD33
CON23.29	-	VSS
CON23.30	-	VSS

- UART8 pin header (CON20)

Connector	GPIO pin of NUC980	Function
CON20.1	GPA12	UART8_TXD
CON20.2	GPA11	UART8_RXD
CON20.3	-	VDD33
CON20.4	-	VSS

- SD0/eMMC0 (CON6): Use Micro SD/eMMC memory card for system booting, data storage or SDIO (Wi-Fi) device
- Power on setting (SW1, R24~R27)

Switch	Status	Function	GPIO pin of NUC980
SW1.2/SW1.1	ON/ON	Boot from USB	GPG1/GPG0
SW1.2/SW1.1	ON/OFF	Boot from SD/eMMC	GPG1/GPG0
SW1.2/SW1.1	OFF/OFF	Boot from QSPI0 Flash	GPG1/GPG0

Resistance	Status	Function	GPIO pin of NUC980
R24	Solder R	Watchdog Timer OFF	GPG3
R24	Remove	Watchdog Timer ON	GPG3

Resistance	Status	Function	GPIO pin of NUC980
R25	Solder R	UART0 debug message ON	GPG5
R25	Remove	UART0 debug message OFF	GPG5

If SW1.2/SW1.1 status is ON / OFF

Resistance	Status	Function	GPIO pin of NUC980
R27/R26	Remove	SD0/eMMC0 boot from GPC group	GPG9/GPG8

If SW1.2/SW1.1 status is OFF / OFF

Resistance	Status	Function	GPIO pin of NUC980
R27/R26	Solder R/ Solder R	SPI-NAND Flash boot with 1-bit mode	GPG9/GPG8
R27/R26	Solder R/ Remove	SPI-NAND Flash boot with 4-bit mode	GPG9/GPG8

R27/R26	Remove/ Solder R	SPI-NOR Flash boot with 4-bit mode	GPG9/GPG8
R27/R26	Remove/ Remove	SPI-NOR Flash boot with 1-bit mode	GPG9/GPG8

- USB0 Device/HOST (CON21, JP3): USB0 Device/HOST Micro-B connector, By JP3 status or defined by the ID pin of the USB cable
- USB1 HOST (CON22): USB1 for USB HOST with type-A connector
- Ethernet0\_PE (CON7, U9): For Ethernet port, the NUC980 support RMI interface which add one Ethernet PHY IP101GR to RJ45 connector with LED indicator
- SOC CPU: NUC980DK61Y (U5)
- Ethernet1\_PF (CON8, U11): For Ethernet port, the NUC980 support RMI interface which add one Ethernet PHY IP101GR to RJ45 connector with LED indicator

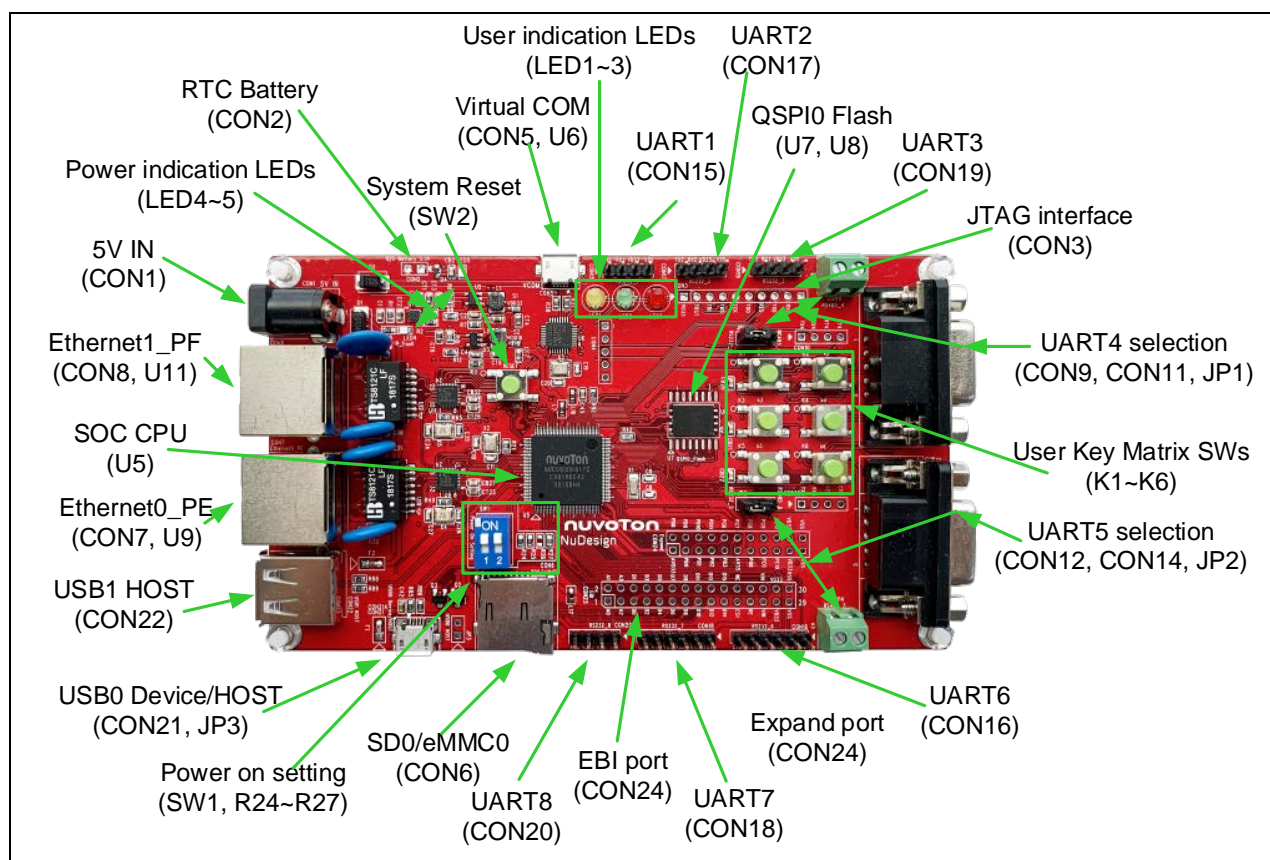


Figure 2-1 NuDesign NK-980ETH2P Demo Board (Front View)

## 2.3 NuDesign NK-980ETH2P Demo Board — Rear View

Figure 2-2 shows the main components from the rear view of NuDesign NK-980ETH2P demo board

- RS232-4/5 transceivers with SN75C3232E (U13 and U15)
- RS485-4/5 transceivers with SN65HVD10 (U14 and U16)

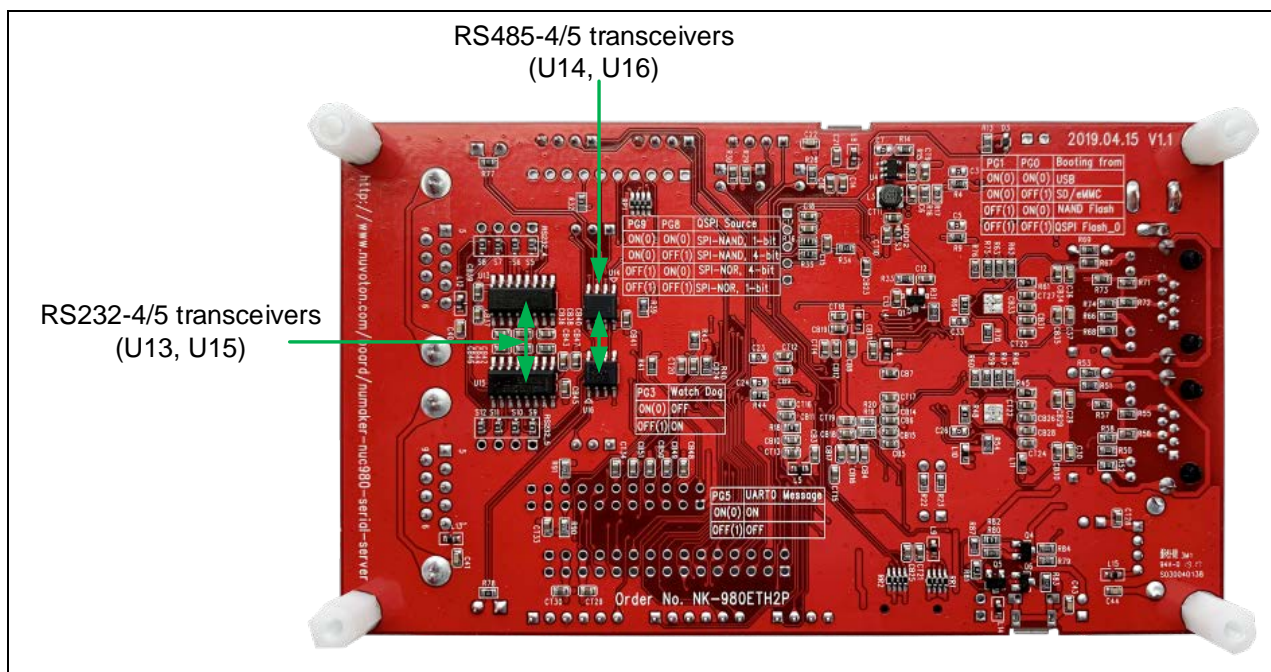


Figure 2-2 NuDesign NK-980ETH2P Demo Board (Rear View)

## 2.4 NuDesign NK-980ETH2P Demo Board PCB Placement

The following figure shows NuDesign NK-980ETH2P demo board PCB placement.

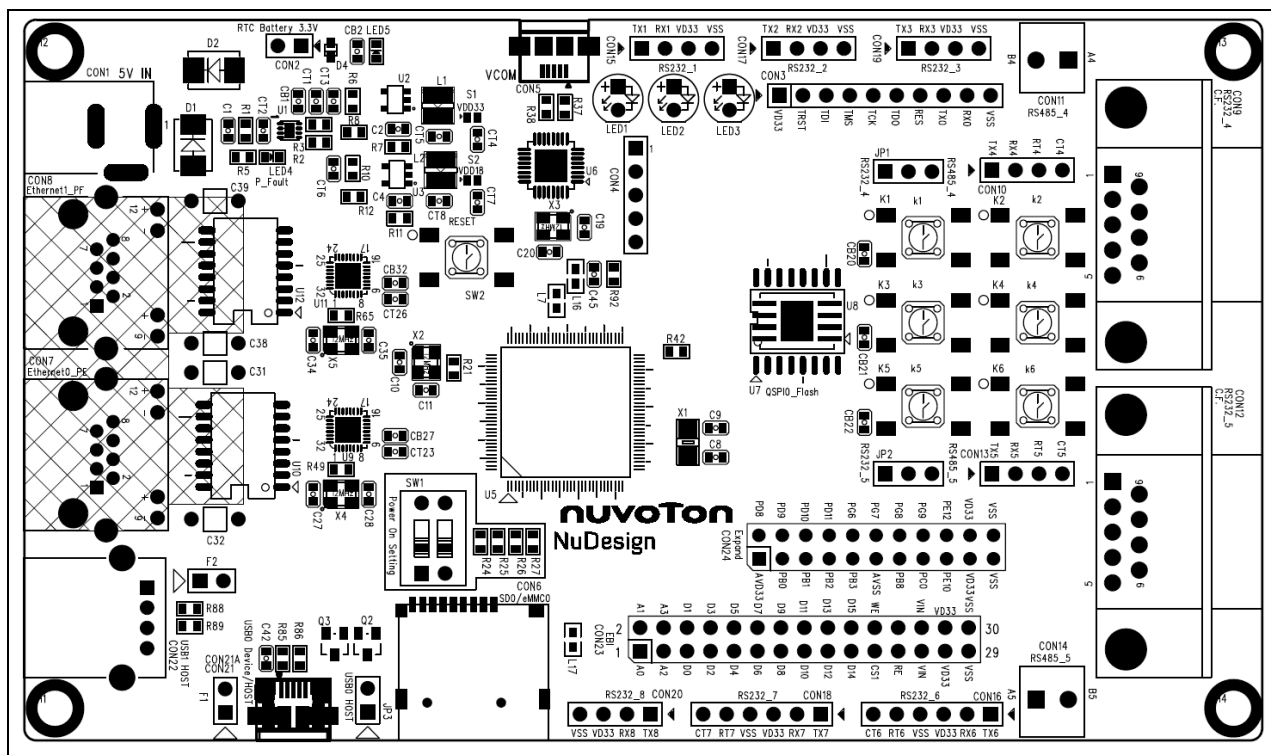


Figure 2-3 NuDesign NK-980ETH2P Demo Board Front PCB Placement

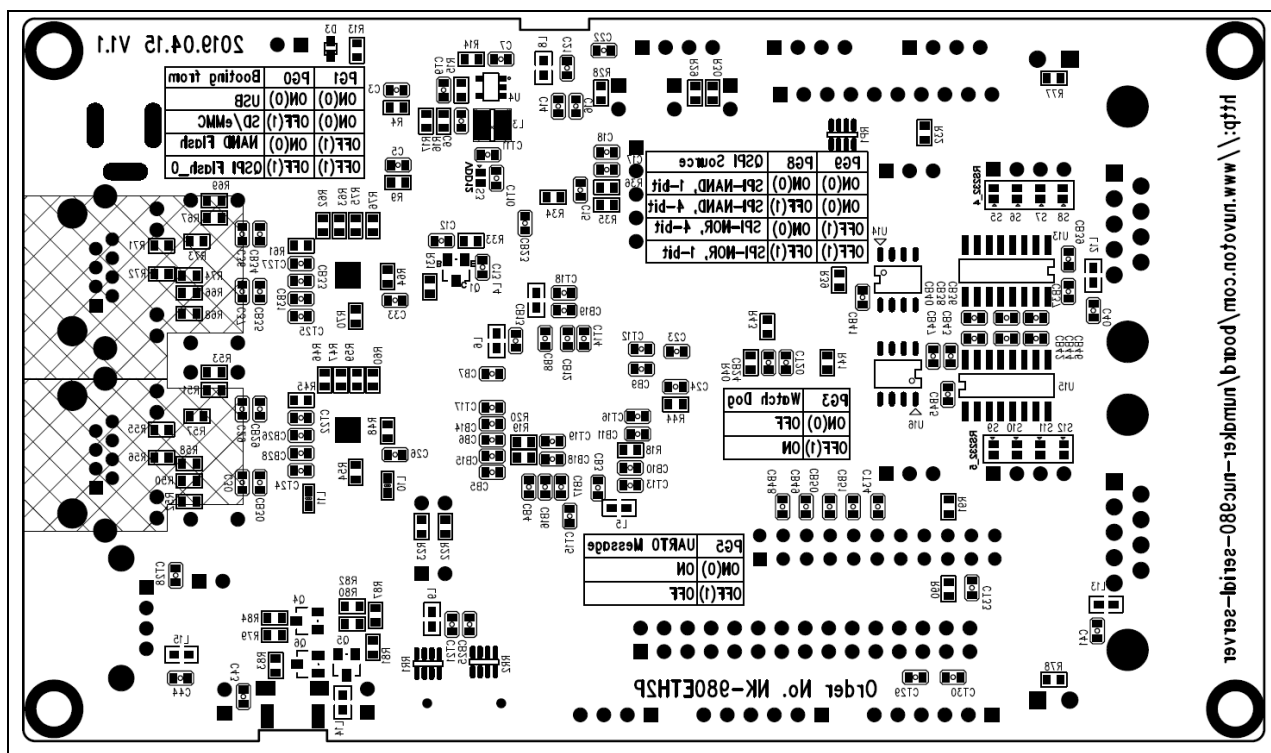


Figure 2-4 NuDesign NK-980ETH2P Demo Board Back PCB Placement



### 3 STARTING TO USE VCOM FUNCTION

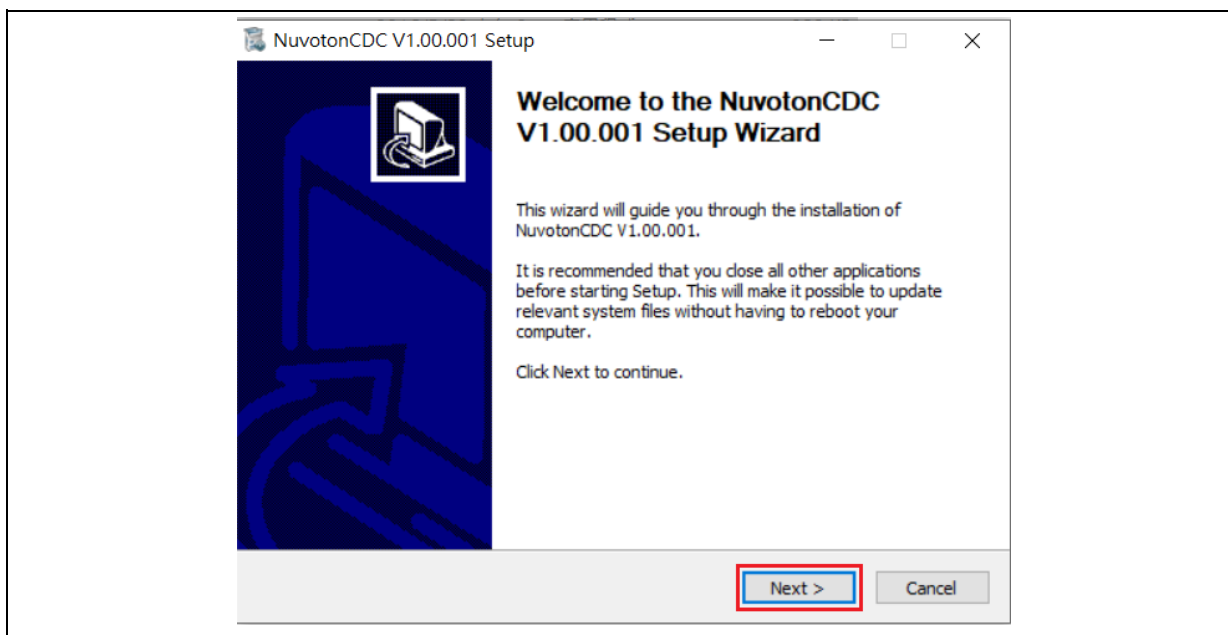
#### 3.1 Download USB CDC Driver

Please download Nuvoton USB CDC driver from Nuvoton's official webpage:

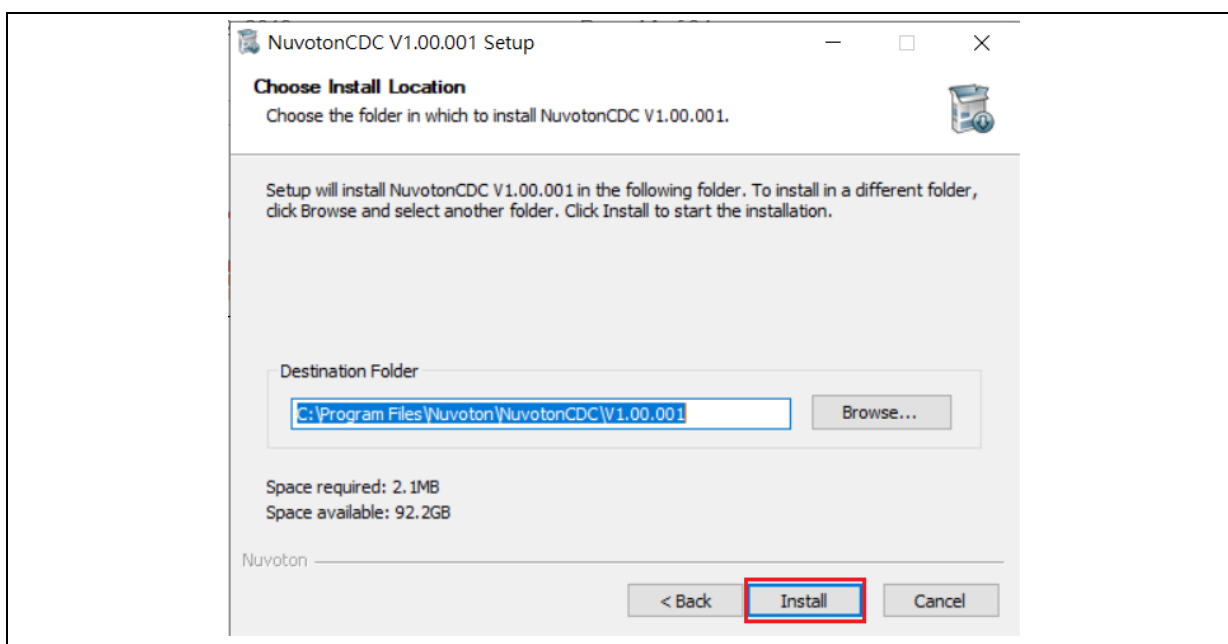
[http://www.nuvoton.com/opencms/resource-download.jsp?tp\\_GUID=SW1020160914071736](http://www.nuvoton.com/opencms/resource-download.jsp?tp_GUID=SW1020160914071736)

#### 3.2 Install Nuvoton USB CDC Driver

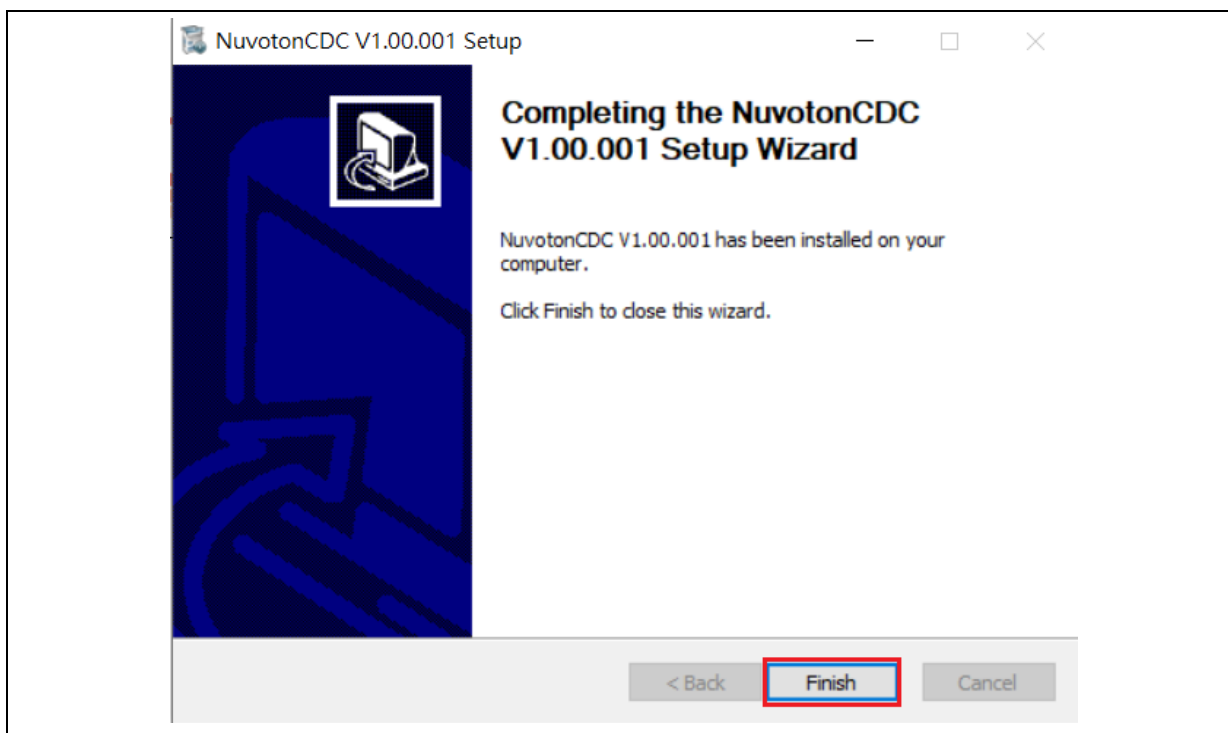
Please execute the "NuvotonCDC\_V1.00.001\_Setup.exe" to install the driver.



Click "Next".



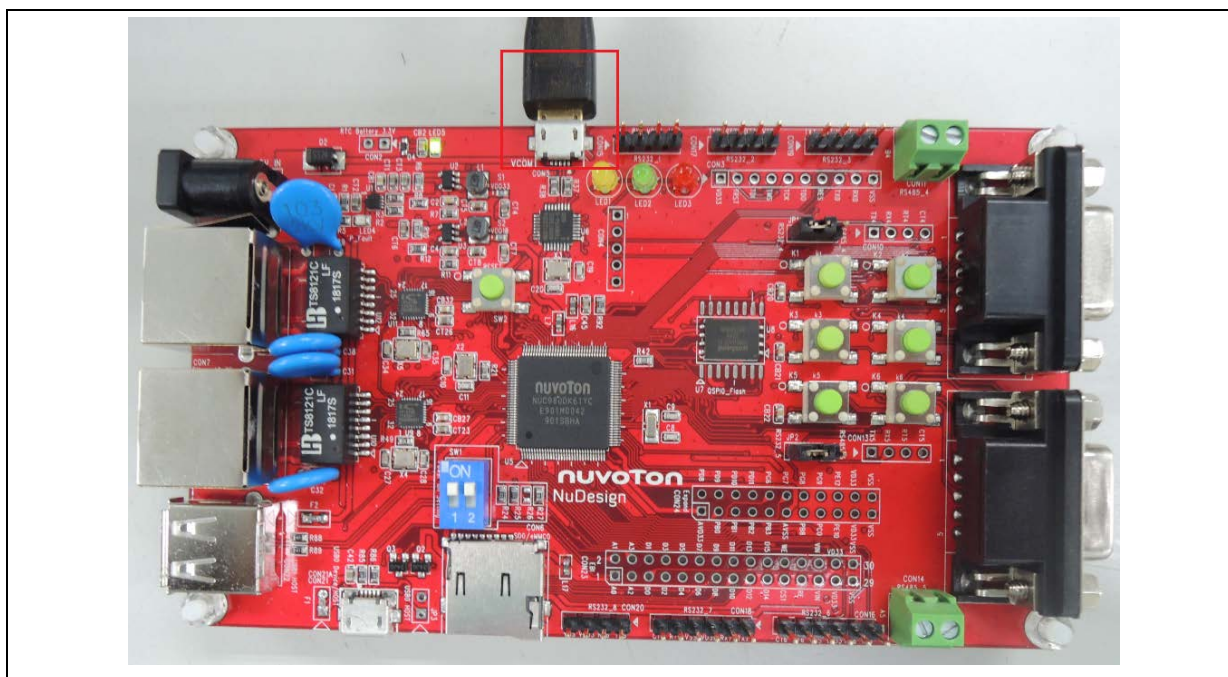
Click "Install".



Click **"Finish"** to finish install driver.

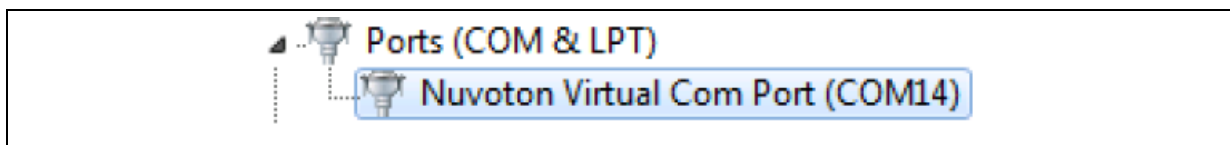
### 3.3 Connect and Set Up Hardware

If the installation is successful, the PC will recognize the board as a USB composite device when the USB micro-B port (CON5) connect the PC HOST.

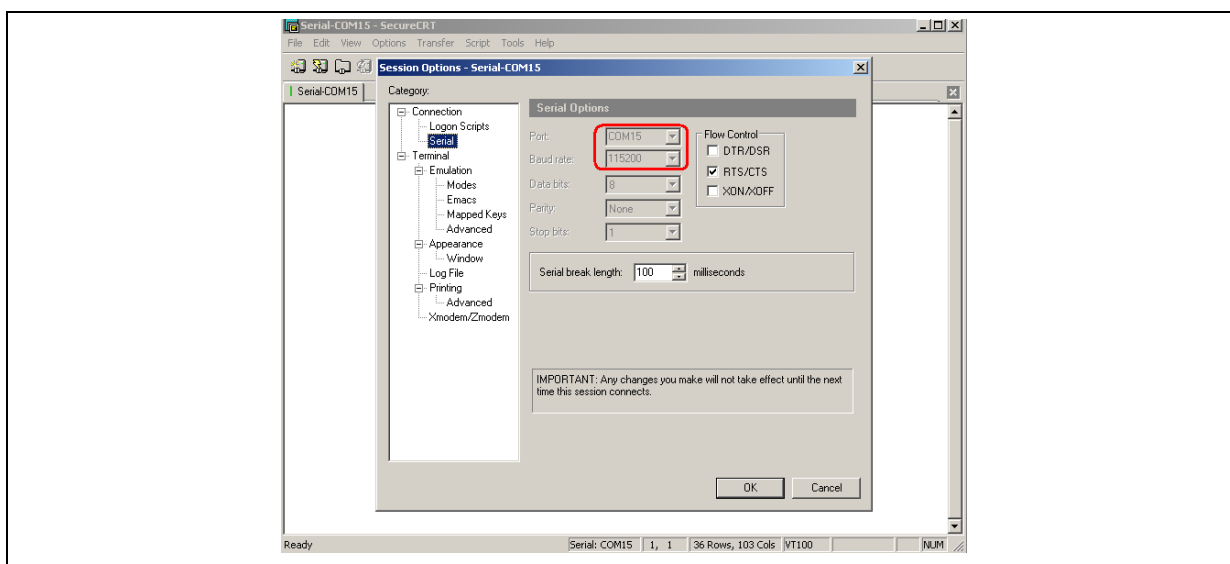


### 3.4 Open USB CDC Serial COM Port

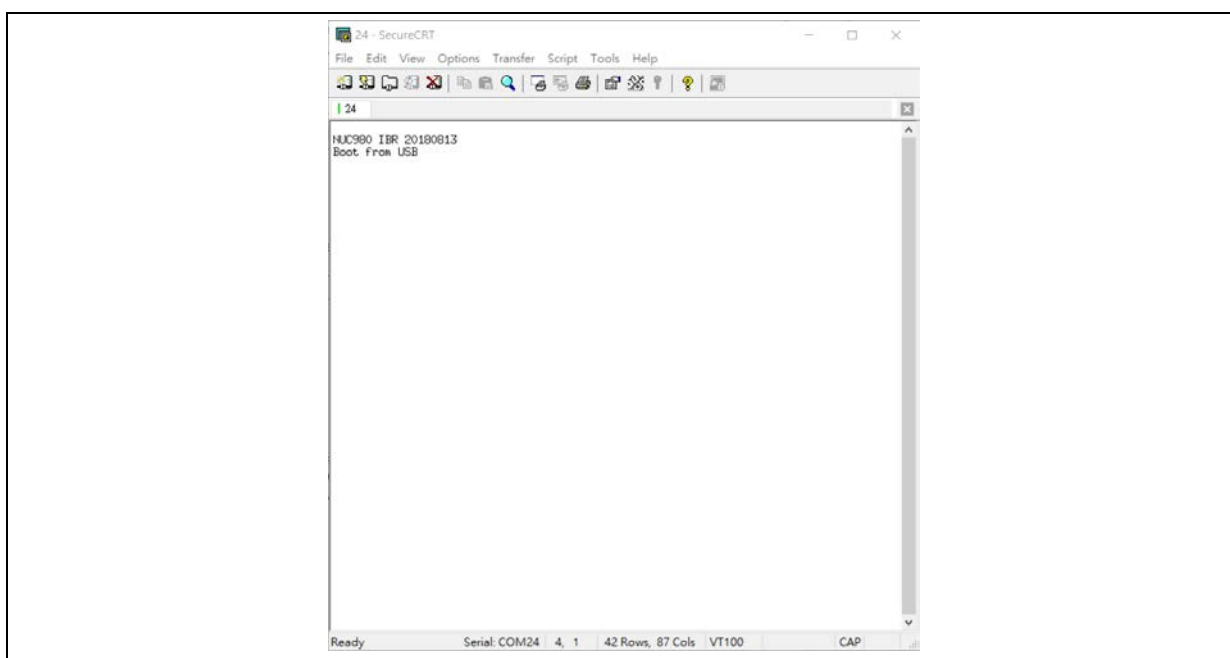
Check the COM port number from device manager.



- Use SecureCRT, HyperTerminal, Putty or TeraTerm to open the serial COM port, and set the baud rate to 115200.

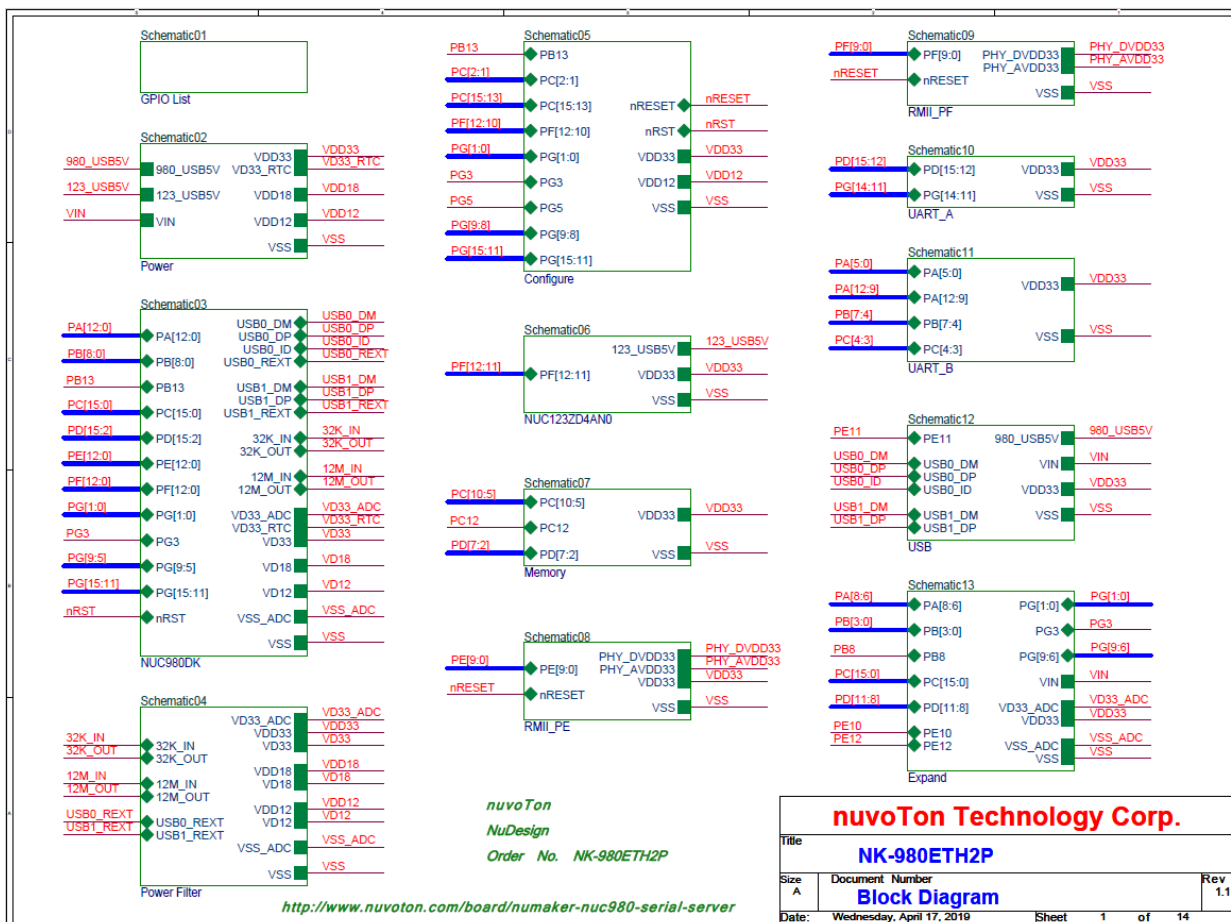


- After pressing the reset button (SW2), the chip will reprogram application and print out debug message.



## 4 NUDESIGN NK-980ETH2P SCHEMATICS

### 4.1 NuDesign NK-980ETH2P — Block Diagram Schematic



## 4.2 NuDesign NK-980ETH2P — GPIO List Schematic

PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION
PA0	UART1_RXD	PB0	ADC_AIN[0]	PC0	CAN2_TXD	PD2	QSPI0_SS0	PE0	RMII0_RXERR	PF0	RMII1_RXERR	PG0	EBI_ADDR0
PA1	UART1_TXD	PB1	ADC_AIN[1]	PC1	EBI_DATA0	PD3	QSPI0_CLK	PE1	RMII0_CRSDV	PF1	RMII1_CRSDV	PG1	EBI_ADDR1
PA2	UART6_CTS	PB2	ADC_AIN[2]	PC1	Co10	PD4	QSPI0_D0	PE2	RMII0_RXD1	PF2	RMII1_RXD1	PG1	CFG[1]
PA3	UART6_RTS	PB2	EBI_ADDR2	PC2	Co11	PD5	QSPI0_D1	PE3	RMII0_RXD0	PF3	RMII1_RXD0	PG3	EBI_ADDR3
PA4	UART6_RXD	PB3	ADC_AIN[3]	PC2	EBI_DATA2	PD6	QSPI0_D2	PE4	RMII0_REFCLK	PF4	RMII1_REFCLK	PG5	CFG[5]
PA5	UART6_TXD	PB4	UART7_RXD	PC3	UART3_TXD	PD7	QSPI0_D3	PE5	RMII0_TXEN	PF5	RMII1_TXEN	PG6	PWM10
PA6	EBI_nCS1	PB5	UART7_RTS	PC4	EBI_DATA3	PD8	SPI0_SS0	PE6	RMII0_TXD1	PF6	RMII1_TXD1	PG7	PWM11
PA7	EBI_nWE	PB6	UART7_TXD	PC5	SD0_CMD	PD9	SPI0_CLK	PE7	RMII0_TXD0	PF7	RMII1_TXD0	PG8	PWM12
PA8	EBI_nRE	PB7	UART7_CTS	PC6	EBI_DATA4	PD10	SPI0_DO	PE8	RMII0_MDIO	PF8	RMII1_MDIO	PG8	CFG[8]
PA9	UART2_RXD	PB8	CAN2_RXD	PC6	SD0_CLK	PD11	SPI0_DI	PE9	RMII0_MDC	PF9	RMII1_MDC	PG9	PWM13
PA10	UART2_TXD	PB13	LED2	PC7	EBI_DATA6	PD12	UART4_TXD	PE10	I2C0_SDA	PF10	LED3	PG11	UART5_CTS
PA11	UART8_RXD			PC8	SD0_DATA0	PD13	UART4_RXD	PE11	USB0_VBUSVLD	PF11	UART0_RXD	PG12	JTAG0_TDO
PA12	UART8_TXD			PC8	EBI_DATA7	PD14	UART4_RTS	PE12	I2C0_SCL	PF12	UART0_TXD	PG13	UART5_RTS
				PC9	SD0_DATA1	PD15	UART4_CTS					PG14	UART5_TXD
				PC9	EBI_DATA8							PG15	JTAG0_TDI
				PC10	SD0_DATA2								JTAG0_TCK
				PC10	EBI_DATA9								UART5_RXD
				PC11	SD0_DATA3								JTAG0_TMS
				PC11	EBI_DATA10								UART5_TXD
				PC12	LED1								JTAG0_TDI
				PC12	EBI_DATA11								JTAG0_NTRST
				PC13	SD0_nCD								LED1
				PC13	EBI_DATA12								
				PC14	Row0								
				PC14	EBI_DATA13								
				PC15	Row1								
				PC15	EBI_DATA14								
				PC15	Row2								
				PC15	EBI_DATA15								

**nuvoTon Technology Corp.**

Title  
**NK-980ETH2P**

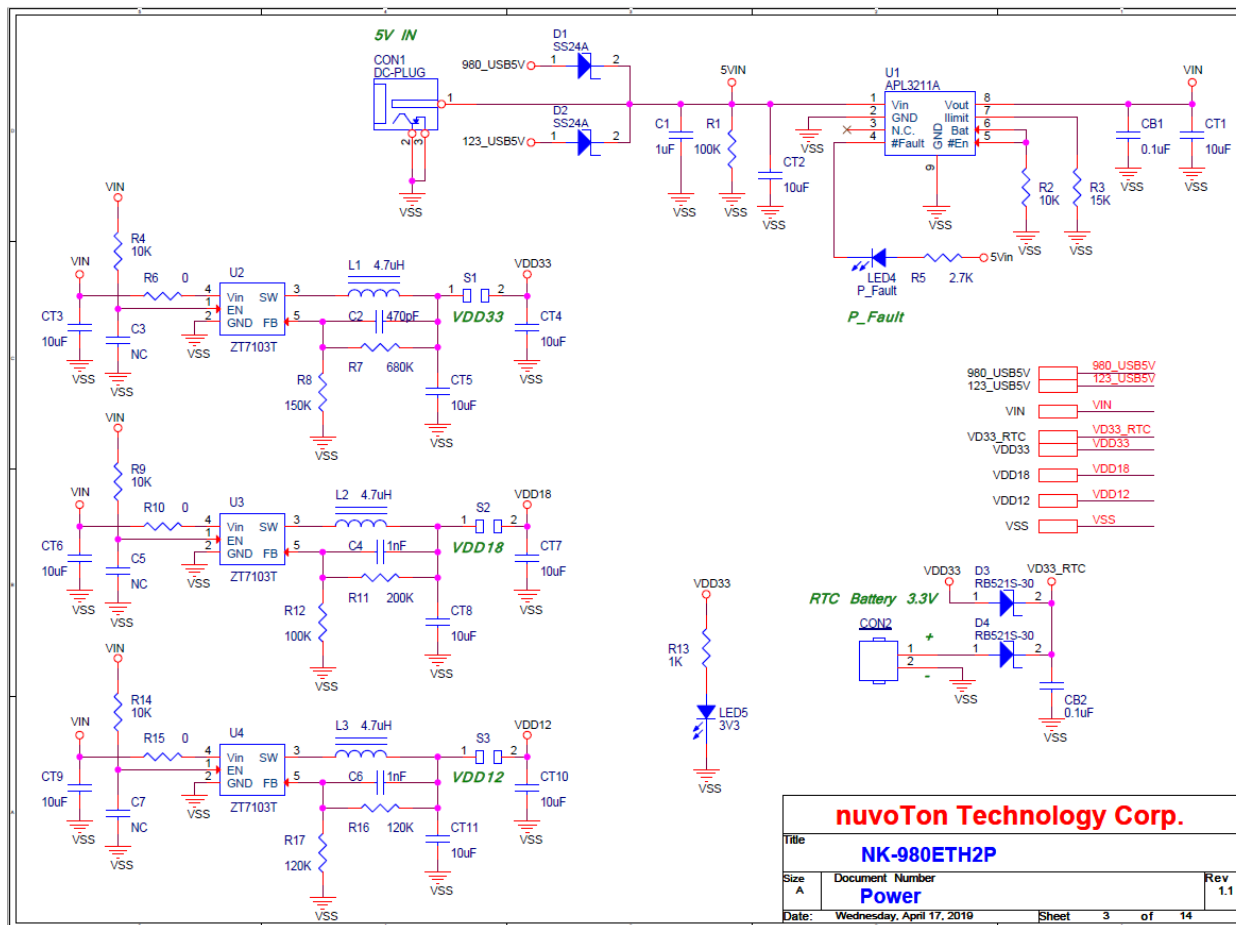
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**GPIO List**

Date: Wednesday, April 17, 2019 Sheet 2 of 14

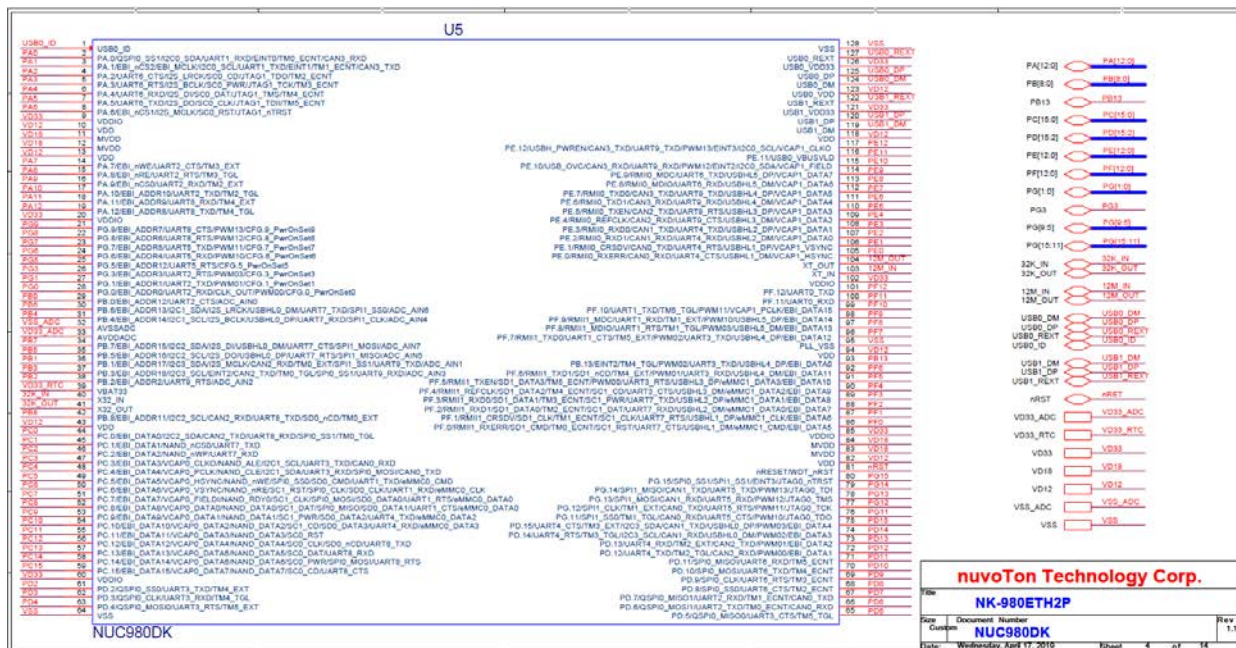
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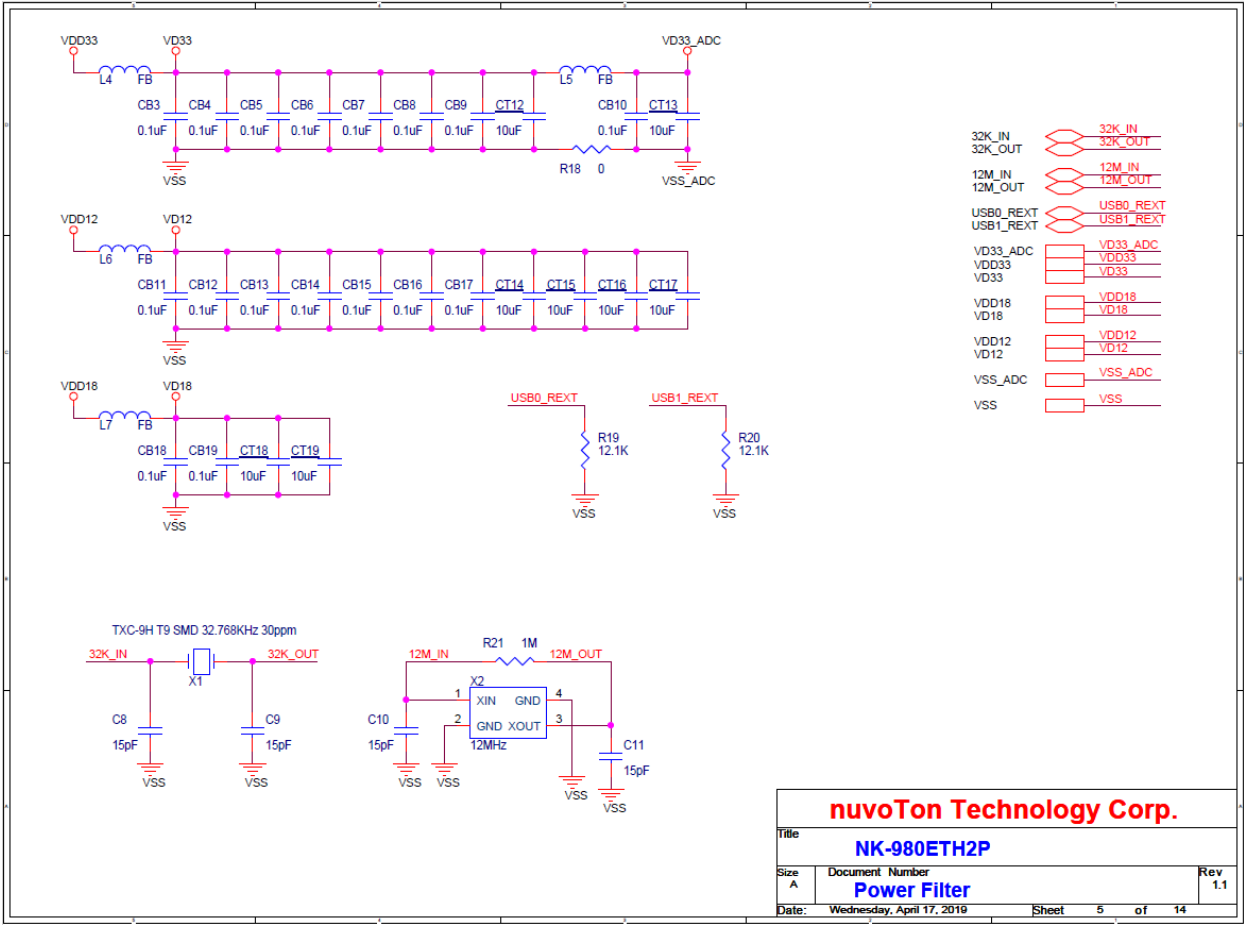
### 4.3 NuDesign NK-980ETH2P — Power Schematic



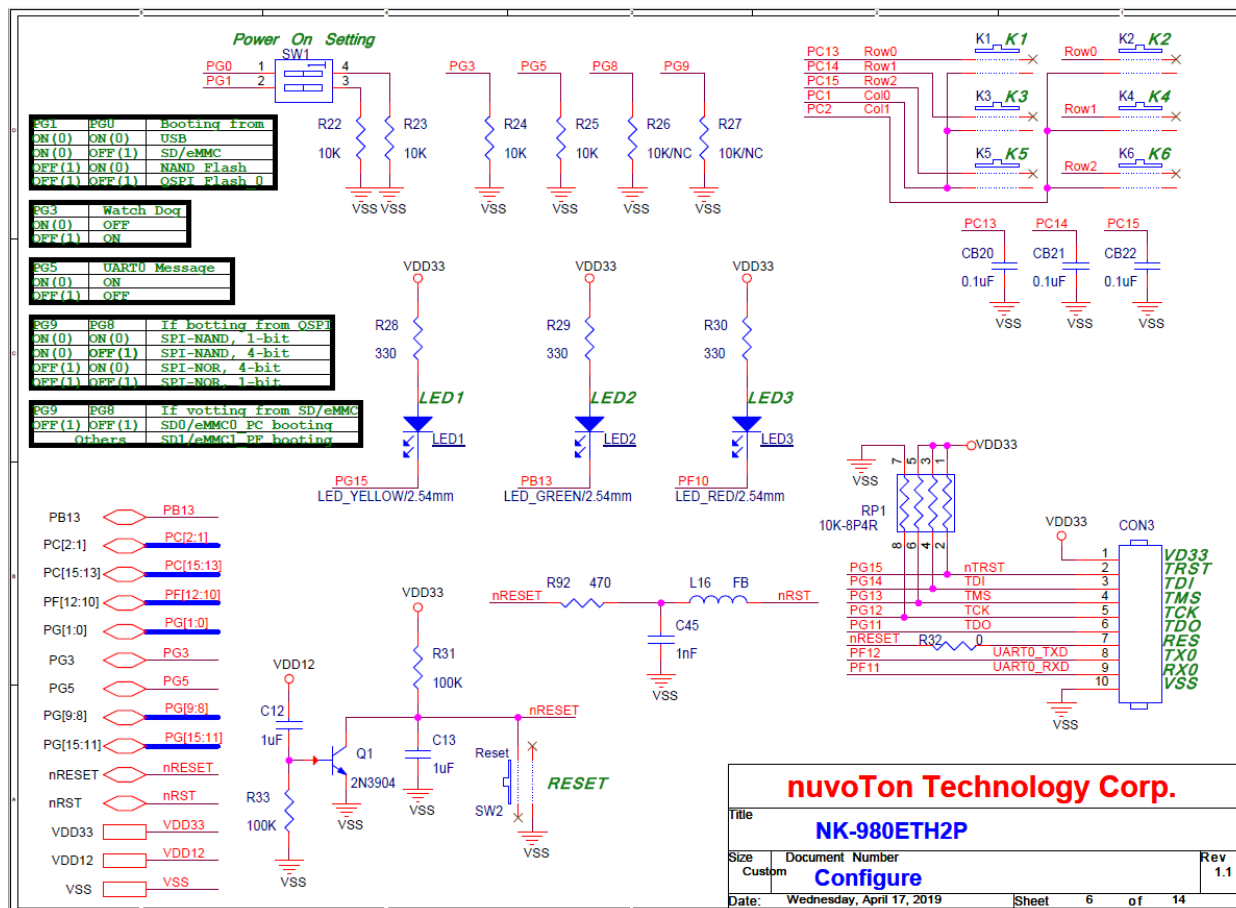
## 4.4 NuDesign NK-980ETH2P – NUC980DK Schematic



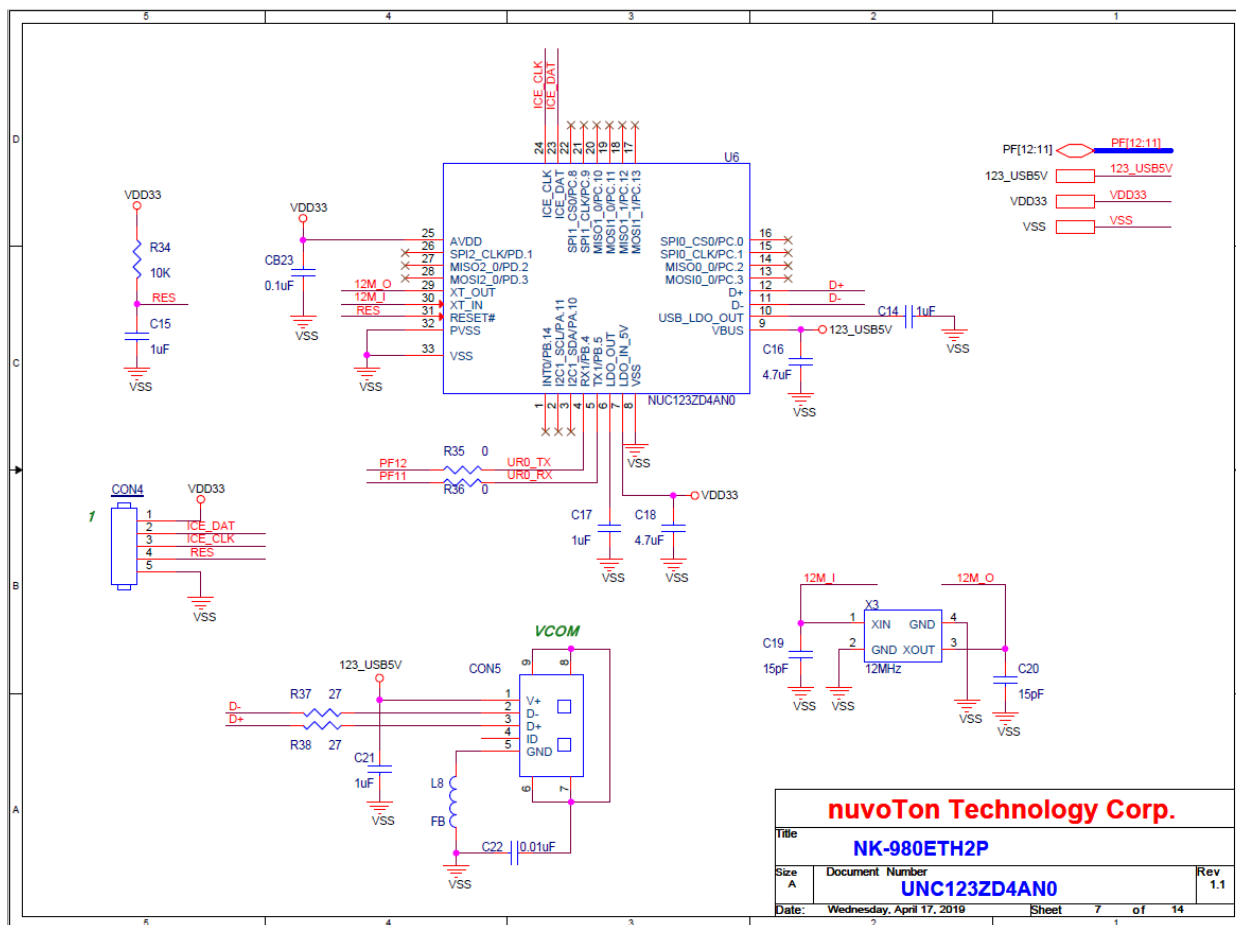
4.5 NuDesign NK-980ETH2P – Power Filter Schematic



## 4.6 NuDesign NK-980ETH2P – Configure Schematic

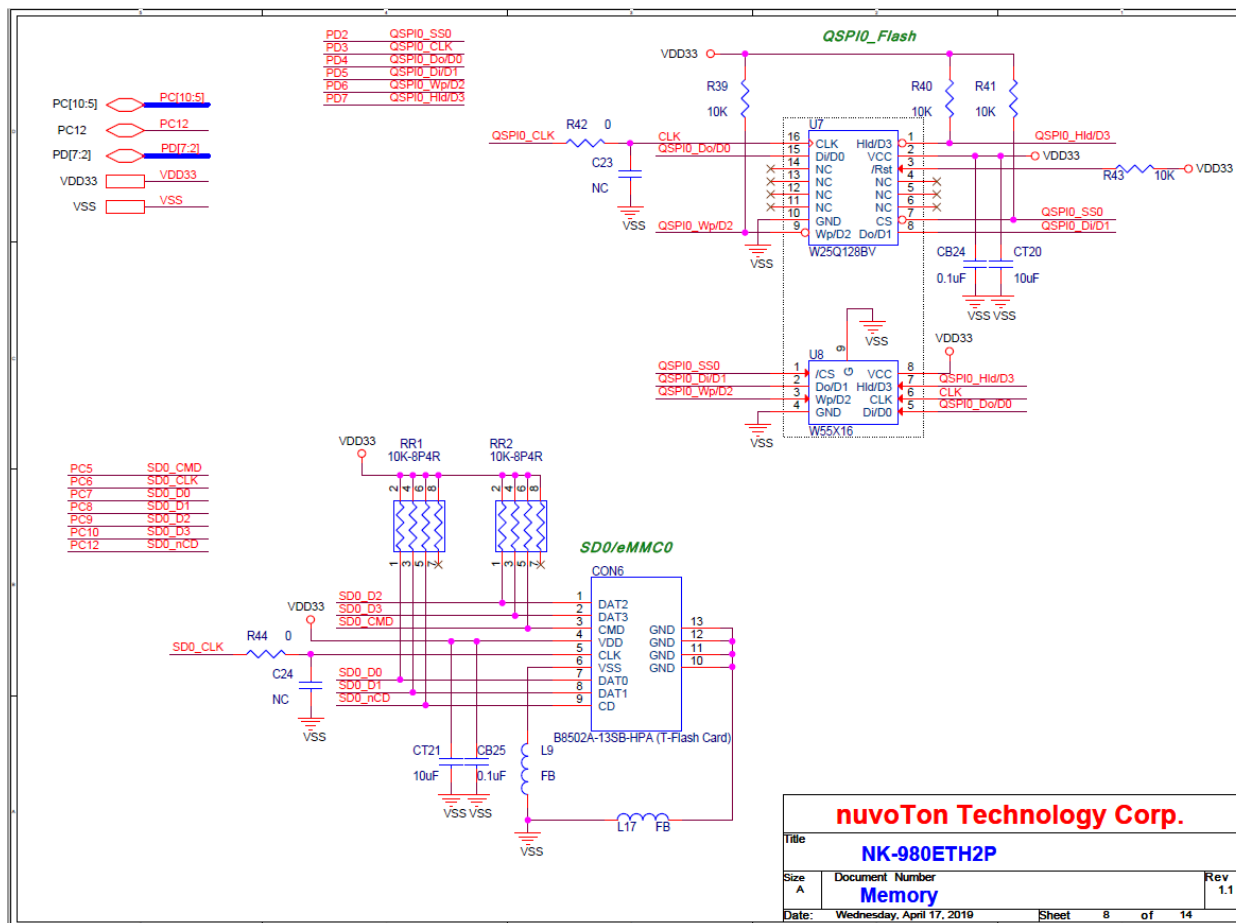


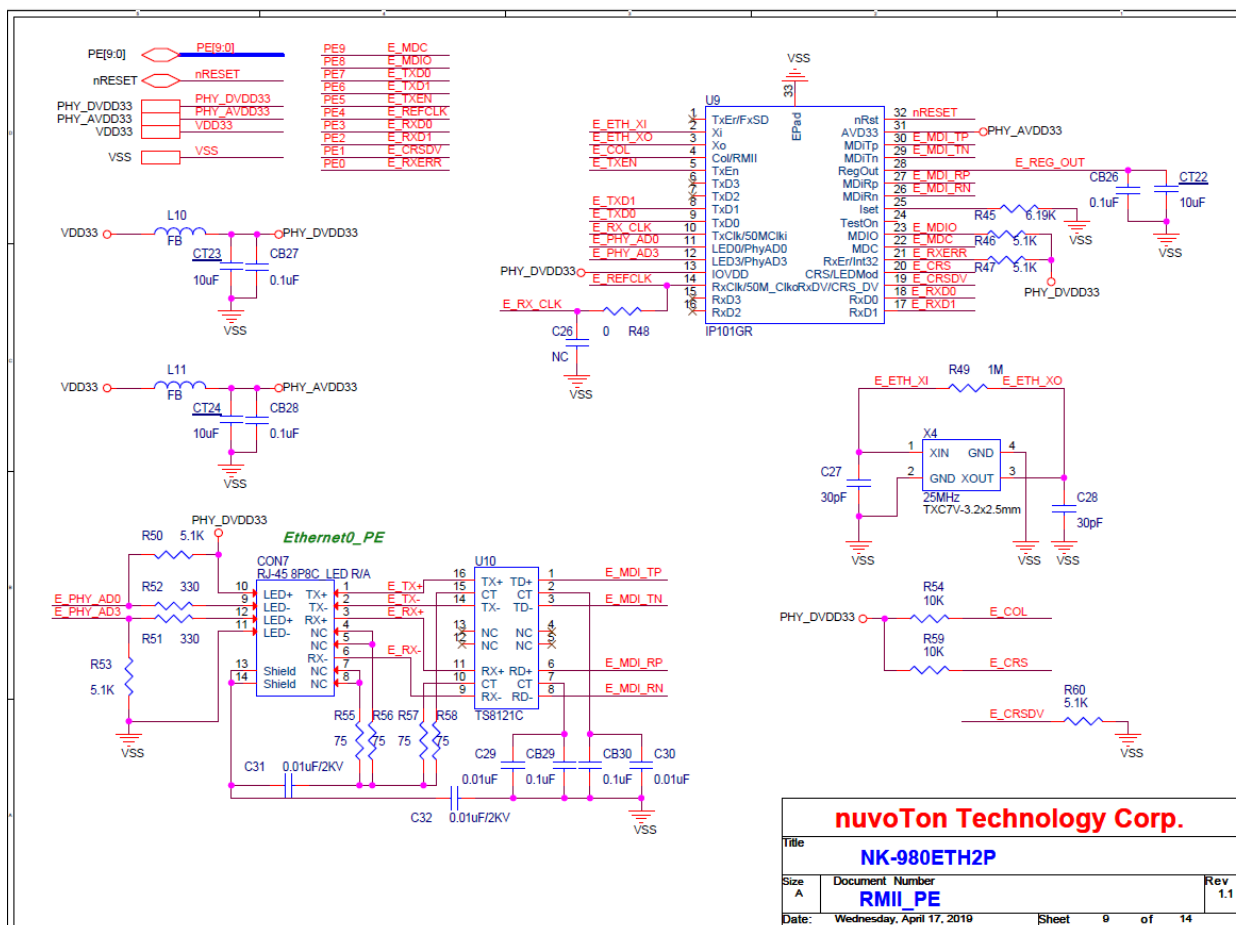
#### 4.7 NuDesign NK-980ETH2P — NUC123ZD4AN0 Schematic





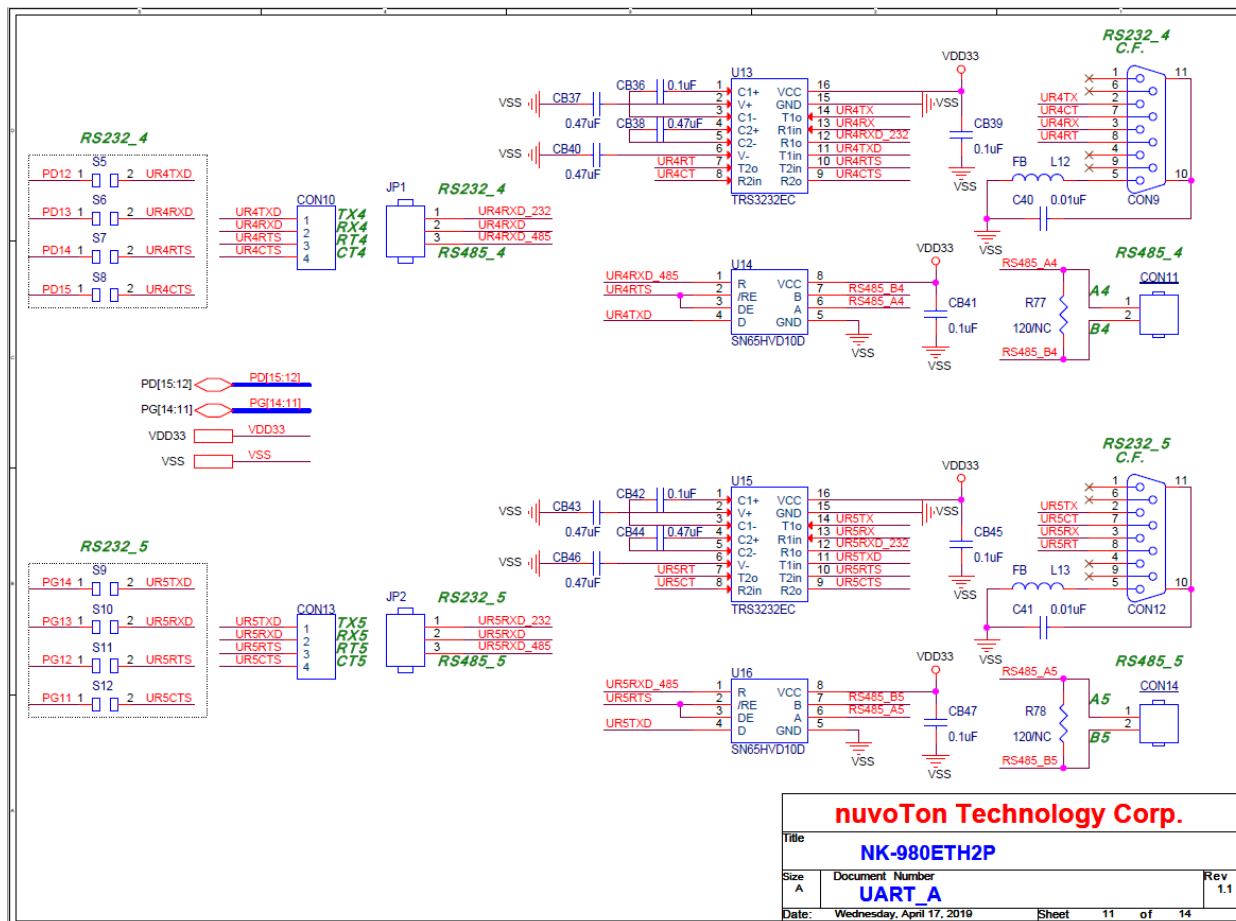
## 4.8 NuDesign NK-980ETH2P — Memory Schematic



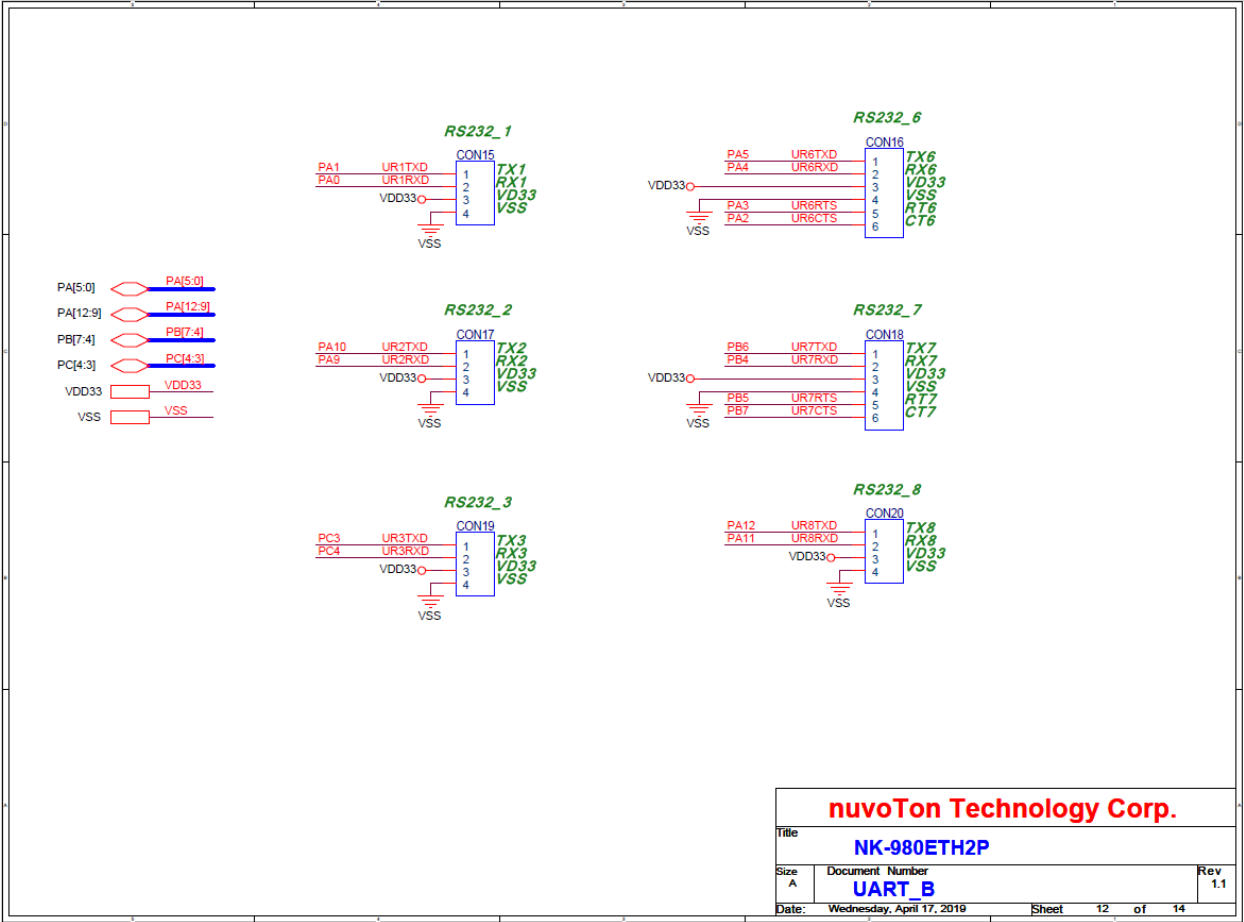


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#### 4.11 NuDesign NK-980ETH2P – UART\_A Schematic

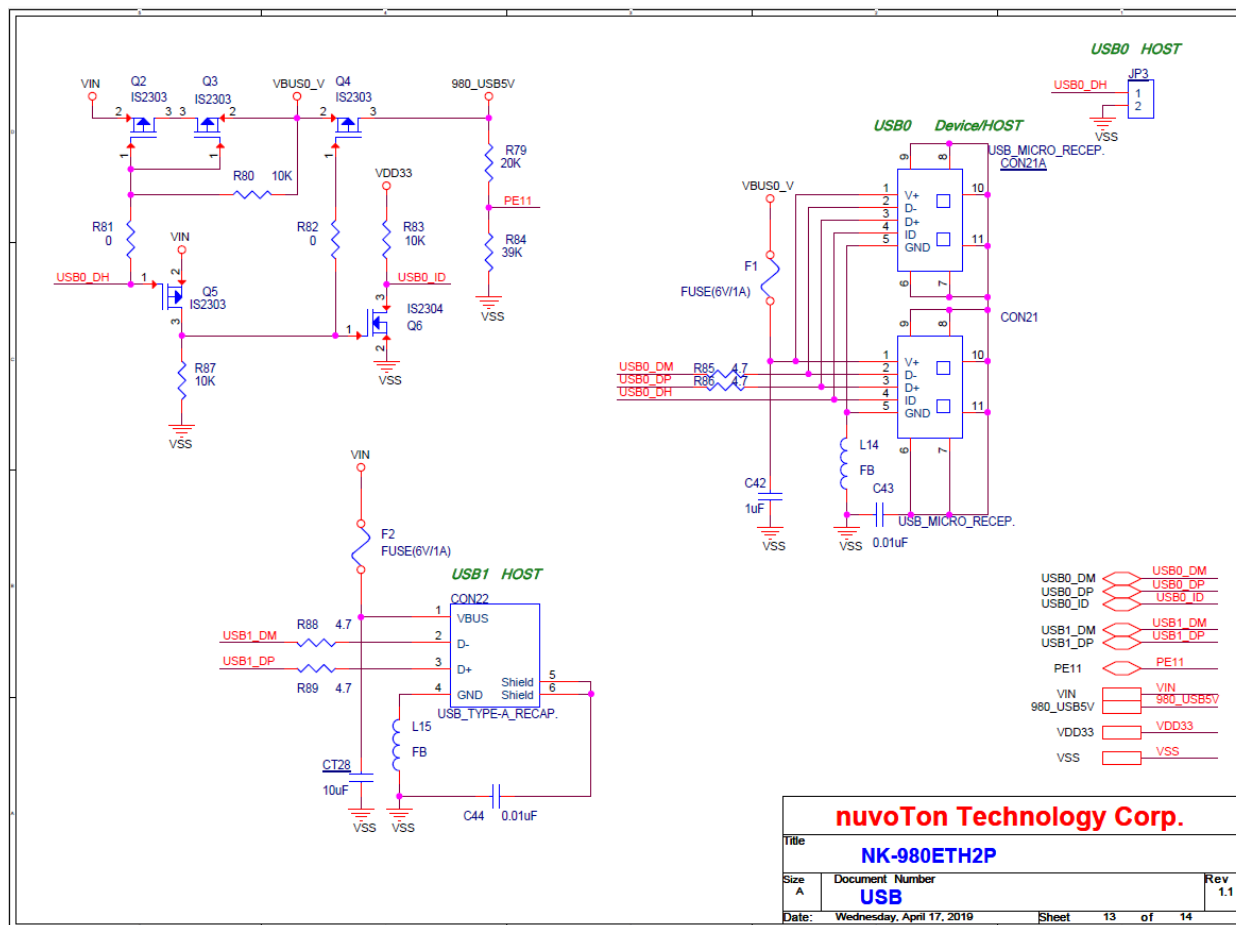


4.12 NuDesign NK-980ETH2P – UART\_B Schematic





### 4.13 NuDesign NK-980ETH2P — USB Schematic



**PA[8:6]** **PA[8:6]**  
**PB[3:0]** **PB[3:0]**  
**PB8** **PB8**  
**PC[15:0]** **PC[15:0]**  
**PD[11:8]** **PD[11:8]**  
**PE10** **PE10**  
**PE12** **PE12**  
**PG[1:0]** **PG[1:0]**  
**PG3** **PG3**  
**PG[9:6]** **PG[9:6]**

**VIN** **VIN**  
**VD33\_ADC** **VD33\_ADC**  
**VDD33** **VDD33**  
**VSS\_ADC** **VSS\_ADC**  
**VSS** **VSS**

**PA6** **PA6**  
**PA7** **PA7**  
**PA8** **PA8**

**PB0** **PB0**  
**PB1** **PB1**  
**PB2** **PB2**  
**PB3** **PB3**

**PD8** **PD8**  
**PD9** **PD9**  
**PD10** **PD10**  
**PD11** **PD11**

**PE8** **PE8**  
**PE10** **PE10**  
**PE12** **PE12**

**PG6** **PG6**  
**PG7** **PG7**  
**PG8** **PG8**  
**PG9** **PG9**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC3** **PC3**  
**PC4** **PC4**  
**PC5** **PC5**  
**PC6** **PC6**  
**PC7** **PC7**  
**PC8** **PC8**  
**PC9** **PC9**  
**PC10** **PC10**  
**PC11** **PC11**  
**PC12** **PC12**  
**PC13** **PC13**  
**PC14** **PC14**  
**PC15** **PC15**

**PG0** **PG0**  
**PG1** **PG1**  
**PG2** **PG2**  
**PG3** **PG3**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC3** **PC3**  
**PC4** **PC4**  
**PC5** **PC5**  
**PC6** **PC6**  
**PC7** **PC7**  
**PC8** **PC8**  
**PC9** **PC9**  
**PC10** **PC10**  
**PC11** **PC11**  
**PC12** **PC12**  
**PC13** **PC13**  
**PC14** **PC14**  
**PC15** **PC15**

**PG0** **PG0**  
**PG1** **PG1**  
**PG2** **PG2**  
**PG3** **PG3**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC3** **PC3**  
**PC4** **PC4**  
**PC5** **PC5**  
**PC6** **PC6**  
**PC7** **PC7**  
**PC8** **PC8**  
**PC9** **PC9**  
**PC10** **PC10**  
**PC11** **PC11**  
**PC12** **PC12**  
**PC13** **PC13**  
**PC14** **PC14**  
**PC15** **PC15**

**PG0** **PG0**  
**PG1** **PG1**  
**PG2** **PG2**  
**PG3** **PG3**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC3** **PC3**  
**PC4** **PC4**  
**PC5** **PC5**  
**PC6** **PC6**  
**PC7** **PC7**  
**PC8** **PC8**  
**PC9** **PC9**  
**PC10** **PC10**  
**PC11** **PC11**  
**PC12** **PC12**  
**PC13** **PC13**  
**PC14** **PC14**  
**PC15** **PC15**

**PG0** **PG0**  
**PG1** **PG1**  
**PG2** **PG2**  
**PG3** **PG3**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC3** **PC3**  
**PC4** **PC4**  
**PC5** **PC5**  
**PC6** **PC6**  
**PC7** **PC7**  
**PC8** **PC8**  
**PC9** **PC9**  
**PC10** **PC10**  
**PC11** **PC11**  
**PC12** **PC12**  
**PC13** **PC13**  
**PC14** **PC14**  
**PC15** **PC15**

**PG0** **PG0**  
**PG1** **PG1**  
**PG2** **PG2**  
**PG3** **PG3**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC3** **PC3**  
**PC4** **PC4**  
**PC5** **PC5**  
**PC6** **PC6**  
**PC7** **PC7**  
**PC8** **PC8**  
**PC9** **PC9**  
**PC10** **PC10**  
**PC11** **PC11**  
**PC12** **PC12**  
**PC13** **PC13**  
**PC14** **PC14**  
**PC15** **PC15**

**PG0** **PG0**  
**PG1** **PG1**  
**PG2** **PG2**  
**PG3** **PG3**

**PC0** **PC0**  
**PC1** **PC1**  
**PC2** **PC2**  
**PC**

## 5 REVISION HISTORY

Date	Revision	Description
2019.10.03	1.11	SPI-NOR change to SPI-NAND
2019.08.19	1.10	1. Add installation VCOM driver for showing message 2. The schematic version changed from V1.0 to V1.1
2019.08.02	1.01	Modify VCOM section
2018.12.21	1.00	Initially issued.

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