DST-NUC980EVB User Manual

www.szdst.com.cn

Table of Contents

1	Ov	erview	5
2	Fe	atures	6
3	Ha	rdware Configuration	7
3.1		Front View	7
3.2	2	Rear View	11
4	Q	uick Start12	
4.1		BSP Download	
4.2	2	Driver Installation	
4.3	3	Hardware Setting	15
4.4	ŀ	Programing Kernel and U-Boot to SPI NAND Flash	17
5	Blo	ock Diagram Schematic	21
5.1		GPIO List Schematic	21
5.2	2	Power Schematic	22
5.3	3	NUC980DR Schematic	23
5.4	ŀ	Power Filter Schematic	24
5.5	5	Configure Schematic	25
5.6	5	NUC123ZD4AN0 Schematic	26
5.7	,	Memory Schematic	27
5.8	3	RMII_PF connector Schematic	
5.9)	RS485 and CAN Schematic	29
5.1	0	USB Schematic	
5.1	1	PCB Placement	31
6	RE	EVISION HISTORY	

List of Figures

Figure 1-1 DST-NUC980EVB Development Board	5
Figure 3-1 Front View of DST-NUC980EVB	7
Figure 3-2 Rear View of DST-NUC980EVB	11
Figure 4-1 Nuvoton USB Driver Installation Setup	12
Figure 4-2 Nuvoton USB Driver Installation	.14
Figure 4-3 Hardware Setting	15
Figure 4-4 Nuvoton VCOM	16
Figure 4-5 NuWriter Setting	17
Figure 4-6 Program u-boot	18
Figure 4-7 Program uimage	19
Figure 4-8 Program environment	20
Figure 5-1 GPIO List Schematic	21
Figure 5-2 Power Schematic	.22
Figure 5-3 NUC980DR Schematic	23
Figure 5-4 Power Filter Schematic	24
Figure 5-5 Configure Schematic	25
Figure 5-6 NUC123ZD4AN0 Schematic	26
Figure 5-7 Memory Schematic	27
Figure 5-8 RMII_PF connector Schematic	.28
Figure 5-9 RS485 and CAN Schematic	29
Figure 5-10 USB Schematic	.30
Figure 5-14 Front PCB Placement	31
Figure 5-15 Back PCB Placement	31

List of Tables

Table 4-1 Power On Setting	15
rabie i i i even en eetang	

1 OVERVIEW

DST

This document provides a quick start guide for the DST-NUC980EVB Development Board. Users can understand both software and hardware configurations for the DST-NUC980EVB. The platform provides Linux OS and plenty of industrial control protocol for users to implement the Ethernet control applications in a very short time.

The DST-NUC980EVB board uses NUC980DR61YC 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 and SPI flash, all functions of the NUC980DR61YC are placed on the board, including peripheral interfaces such as SPI Flash memory, UART, 10/100 Mb Ethernet MAC controller, high speed USB (Device, Host), JTAG, RS485 and CAN transceiver controller. Users can use it to develop and verify applications to emulate the real behavior.



Figure 1-1 DST-NUC980EVB Development Board

2 FEATURES

- NUC980DR61YC: LQFP64 pin MCP package with DDR2 (64 MB), which can run up to 300MHz operating speed
- SPI Flash: Normal mode system booting or data storage, use W25Q128JV SPI-NOR (128M-Bit)
- Peripheral interface connector, including UART, SPI, I2C
- JTAG interface provided for software development
- RJ45 port (Ethernet0) connector
- UART8-RS485 header with transceiver controller interface
- CAN3 header with transceiver controller interface
- 2 sets of LED for status indication
- 1 sets of user-configurable push button keys
- 1 sets of system-reset push button keys
- 3.3V I/O power, 1.8V Memory power and 1.2V core power

3 HARDWARE CONFIGURATION

3.1 Front View

DST



Figure 3-1 Front View of DST-NUC980EVB

Figure 3-1 shows the main components from the front view of DST-NUC980EVB Development Board

• +5V In : Power 5V input

Power Model	USB	DC 5V
Model 1	Connect to PC	-
Model 3	-	VDD5V Input

• System Reset : System will be reset if the RESET button is pressed

• User indication LEDs (LED1, LED2):

LED	Color	GPIO pin of NUC980
LED1	Green	PC11
LED2	Green	PC3

• SPI NOR Flash (U5): Use Winbond W25Q128JV 128M Bit (U5) for system booting, supporting normal mode

• JTAG interface

Connector	GPIO pin of NUC980	Function
JLINK.1	-	VDD33
JLINK.2	GPA6	nTRST
JLINK.3	GPA5	TDI
JLINK.4	GPA4	TMS
JLINK.5	GPA3	ТСК
JLINK.6	GPA2	TDO
JLINK.7	-	nRESET
JLINK.8	-	VSS

• User Key SW (KEY1)

Кеу	GPIO pin of NUC980
K1	GPC15

• BOOT setting

Switch	Status	Function	GPIO pin of NUC980
BOOT0	ON/ON	Boot from USB	GPG1/GPG0
BOOT1	OFF/OFF	Boot from QSPI0 Flash	GPG1/GPG0

- CAN (JP2, U7): SN65HVD230 transceiver controller of CAN(U10), CAN header connect to device for communication
- Peripheral user interface(P1)

Jun. 10, 2021

Page 10 of 33

Rev 1.00

4 QUICK START

DST

4.1 BSP Download

The burning tool requires a NuWriter driver to be installed on PC first. Please follow the steps below to install the driver.

Please visit nuvoTon's NuMicro[™] website <u>https://www.nuvoton.com/products/iot-solution/iot-platform/numaker-server-nuc980/?group=Software&tab=2</u>) to download the "NUC980_Linux-4.4_BSP_v1.02.001". Run the "**WinUSB4NuVCOM.exe**" before the USB cable is plugged in. The "**WinUSB4NuVCOM.exe**" can be found in the "Tool" directory. Power on the NUC980 Series MPU EVB and plug the USB cable into PC, the Windows shall find a new device and then request to install its driver. Simply follow the installation and optional steps to install USB Driver, included VCOM driver.

4.2 Driver Installation

The programming tool requires a Nuvoton USB driver to be installed on PC first. Please follow the steps below to install the WinUSB driver.

Run the "WinUSB4NuVCOM.exe" before the USB cable is plugged in. The "WinUSB4NuVCOM.exe" can be found in the "Tool" directory. Power on the NUC980 Series MPU EVB and plug the USB cable into PC, the Windows shall find a new device and request to install the driver.



Figure 4-1 Nuvoton USB Driver Installation Setup

Click "Next". The WinUSB driver Setup Wizard will be started.

Select Destination Location Where should WinUSB driver (Nuvoton VCOM) be installed? Setup will install WinUSB driver (Nuvoton VCOM) into the following folder. To continue, click Next. If you would like to select a different folder, click Browse. Program Files (WinUSB&WVCOM) Browse At least 19.8 MB of free disk space is required. (<back next=""> Cancel Setup - WinUSB driver (Nuvoton VCOM) Select Start Menu Folder Where should Setup place the program's shortcuts? Setup Mill create the program's shortcuts in the following Start Menu folder. To continue, click Next. If you would like to select a different folder, click Browse. (Wext > Cancel Continue, click Next. If you would like to select a different folder, click Browse. (Wext SE driver (Nuvotori VCOM) Setup vill create the program's shortcuts in the following Start Menu folder. To continue, click Next. If you would like to select a different folder, click Browse. (Wext) Equivation VCOM) Browse</back>	Setup - WinUSB driver(Nuvoton VCOM)
Setup will install WinUSB driver (Nuvoton VCOM) into the following folder. To continue, dick Next. If you would like to select a different folder, dick Browse. Strogram Files (WinUSB4NUVCOM) Browse At least 19.8 MB of free disk space is required. Setup WinUSB driver (Nuvoton VCOM) Setup Setup - WinUSB driver (Nuvoton VCOM) Select Start Menu Folder Where should Setup place the program's shortcuts? WinUSB driver (Nuvoton VCOM) Setup will create the program's shortcuts in the following Start Menu folder. To continue, dick Next. If you would like to select a different folder, dick Browse. WinUSB driver (Nuvoton VCOM) Equation Setup will create the program's shortcuts in the following Start Menu folder. To continue, dick Next. If you would like to select a different folder, dick Browse. WinUSB driver (Nuvoton VCOM) Browse Cancel	Select Destination Location Where should WinUSB driver(Nuvoton VCOM) be installed?
E:\Program Files\WinUSB4NuVCOM Browse At least 19.8 MB of free disk space is required. Image: Setup - WinUSB driver(Nuvoton VCOM) Cancel Select Start Menu Folder Where should Setup place the program's shortcuts? Image: Setup will create the program's shortcuts in the following Start Menu folder. To continue, dick Next. If you would like to select a different folder, dick Browse. Image: WinUSB driver(Nuvoton VCOM) Browse	Setup will install WinUSB driver(Nuvoton VCOM) into the following folder.
At least 19.8 MB of free disk space is required. < <u>Back</u> <u>Mext</u> Cancel Setup - WinUSB driver(Nuvoton VCOM) Select Start Menu Folder Where should Setup place the program's shortcuts? Setup will create the program's shortcuts in the following Start Menu folder. To continue, click Next. If you would like to select a different folder, click Browse. WinUSB driver(Nuvoton VCOM) Browse Egack <u>Mext</u> Cancel	C:\Program Files\WinUSB4NuVCOM Browse Browse
At least 19.8 MB of free disk space is required. < Back	
< Back	At least 19.8 MB of free disk space is required.
Setup - WinUSB driver(Nuvoton VCOM) Select Start Menu Folder Where should Setup place the program's shortcuts? Image: Setup will create the program's shortcuts in the following Start Menu folder. To continue, click Next. If you would like to select a different folder, click Browse. MinUSB driver(Nuvoton VCOM) Browse <	< <u>Back</u> Cancel
Select Start Menu Folder Where should Setup place the program's shortcuts? Image: Setup will create the program's shortcuts in the following Start Menu folder. To continue, click Next. If you would like to select a different folder, click Browse. MinUSB driver(Nuvoton VCOM) Browse	j ² Setup - WinUSB driver(Nuvoton VCOM)
Setup will create the program's shortcuts in the following Start Menu folder. To continue, dick Next. If you would like to select a different folder, dick Browse. WinUSB driver(Nuvoton VCOM) Browse Browse Cancel	Select Start Menu Folder Where should Setup place the program's shortcuts?
To continue, dick Next. If you would like to select a different folder, dick Browse. WinUSB driver(Nuvoton VCOM) Browse Browse Cancel	Setup will create the program's shortcuts in the following Start Menu folder.
< <u>B</u> ack <u>N</u> ext > Cancel	To continue, dick Next. If you would like to select a different folder, dick Browse. WinUSB driver(Nuvoton VCOM) Browse
< <u>B</u> ack <u>N</u> ext > Cancel	
< <u>B</u> ack Next > Cancel	
< <u>B</u> ack <u>N</u> ext > Cancel	
	< <u>B</u> ack <u>N</u> ext > Cancel

Ready to Install Setup is now ready to be computer. Click Install to continue wi change any settings.	gin installing WinUSB driver(Nuvot	ton VCOM) on your	
Destination location: C:\Program Files\Win Start Menu folder: WinUSB driver(Nuvol	nUSB4NuVCOM ton VCOM)		
•			
	< <u>B</u> ack	Install Cancel	
Device Driver Installation Wiza	rd Completing the De Installation Wizar The drivers were successfully in	evice Driver d	
	Driver Name	Status . Device Updated	

Figure 4-2 Nuvoton USB Driver Installation

The USB serial port function is used to print some messages on PC API, such as SecureCRT, through the standard UART protocol to help user to debug program.

4.3 Hardware Setting

DST



Figure 4-3 Hardware Setting

1. DST-NUC980EVB provides BOOT0, BOOT1 to select boot-up conditions. The BOOT0 and BOOT1 ON to select USB ISP mode.

Switch	Status	Function	GPIO pin of NUC980
BOOT0	ON/ON	Boot from USB	GPG1/GPG0
BOOT1	OFF/OFF	Boot from QSPI0 Flash	GPG1/GPG0

Table 4-1 Power On Setting

2. Plug in the USB cable

If the installation is successful, a virtual COM port can be found in the "Device Manager".



DST-NUC980EVB-V11

DST-NUC980EVB-Mini



Figure 4-4 Nuvoton VCOM

4.4 Programing Kernel and U-Boot to SPI NAND Flash

DST

- 1. Install NuWriter Driver. (Please refer to "NUC980 NuWriter User Manual")
- 2. Set SW1(Power On Setting) to Boot from USB(shown in Table 4-1 and Figure 4-3). Connect USB0 to PC and connect UART console to PC.
- 3. Double click "**NuWriter.exe**" on PC. Select target chip as "NUC980 series" and select DDR parameter is "NUC980DR61YC.ini". And then, press "**Continue**" button.

Nuvoton NuWriter v1.14
Πυνοτοη
Select target chip :
NUC980 series 🗸 🗸
Select DDR parameter :
NUC980DR61YC.ini 🗸
Quit Continue(4)

Figure 4-5 NuWriter Setting

- 4. According to Figure 4-6, following the steps below to program u-boot.bin:
 - a. Select the "SPI " type.
 - b. Fill in the image information:
 - Image Name: u-boot.bin
 - Image Type: Loader
 - Image execute address: 0xe00000
 - c. Click "Program".
 - d. Waiting for the progress bar to be finished.
 - e. After "**Program**" the image, click the "**Verify**" button to read back the image data to make sure the burning status.

oose type :	SPI	V DDR I	nit: NU	C980DR61YC.ini-V2.0 Device Connected • Re-Connect
SPI		0.000	E 1	Parameters
Name	Туре	Start offset	End (Image Name : u-boot 🗃
u-000(46001	UXU	0820	Image Type : O Data O Environment O Loader O Pack
			_	Impass supply to address (0)000000
				Image start offset : 0x 0
				NOR flash parameter: 🔲 User Defined
				👱 Program 🤌 Verify 🚖 Read 📝 Erase
<			>	

Figure 4-6 Program u-boot

- 5. According to Figure 4-7, following the steps to program kernel image:
 - a. Select the "SPI" type.
 - b. Fill in the image information:
 - Image Name: uimage
 - Image Type: Data
 - Image execute address: 0x200000
 - c. Click "Program".
 - d. Waiting the progress bar to be finished.
 - e. After "**Program**" the image, click the "**Verify**" button to read back the image data to make sure the burning status.

hoose type :	SPI	∽ DDR Ir	nit: NU	C980DR61YC.ini-V2.0 Device Connected • Re-Connected
Name ulmage u-boot	Type DATA uBOOT	Start offset 0x200000 0x0	End (0x7e: 0x26i	Parameters Image Name : ulmage Image Type : Data O Environment O Loader O Pack Image execute address : 0x e00000 Image start offset : 0x 200000 NOR flash parameter: User Defined
<		_	>	👱 Program 🤌 Verify 🔔 Read 😰 Erase

Figure 4-7 Program uimage

- 6. According to Figure 4-8, following the steps below to program environment:
 - a. Select the "SPI" type.

- b. Fill in the image information:
 - Image Name: env.txt
 - Image Type: environment
 - Image start offset address: 0x80000
- c. Click "Program".
- d. Waiting for the progress bar to be finished.
- e. After "**Program**" the image, click the "**Verify**" button to read back the image data to make sure the burning status.

ise type :	SPI	✓ DDR Ir	nit: NU	C980DR61YC.ini-V2.0 Device Connected Re-Conne
PI Name env ulmage u-boot	Type ENV DATA uBOOT	Start offset 0x80000 0x200000 0x0	End (0x90) 0x7e: 0x26)	Parameters Image Name : env Image Type : ○ Data ● Environment ○ Loader ○ Pack Image execute address : 0x e00000 Image start offset : 0x 80000 NOR flash parameter: □ User Defined Program Verify Read Erase

Figure 4-8 Program environment

For more details about NuWriter tool, please refer to "**NUC980 NuWriter User Manual**" in the "Documents" directory.

For more details about kernel image and uboot, please refer to "NUC980_970 Linux environment on VMware User Manual" from Nuvoton website.

URL: <u>https://www.nuvoton.com/products/iot-solution/iot-platform/numaker-server-nuc980/?group=Document&tab=2</u>

5 BLOCK DIAGRAM SCHEMATIC

5.1 GPIO List Schematic

DST

PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PII	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION
PAO	CAN3_RXD	PB4	I2C1_SCL	PC3	LED_G	PD2	QSPI0_SSO	PE11	USB0_VBUSVLD	PF0	RMII1_RXERR	PGO	CFG[0]
PA1	CAN3_TXD	PB6	I2C1_SDA	PC4	SPI0_DO	PD:	QSPI0_CLK			PF1	RMII1_CRSDV		
PA2	JTAG1_TDO			PC5	SPIO_SSO	PD4	QSPI0_DO			PF2	RMII1_RXD1	PG1	CFG [1]
PA3	jtag1_tck			PC 6	SPI0_CLK	PDS	QSPI0_DI			PF3	RMII1_RXD0		
PA4	JTAG1_TMS			PC8	SPI0_DI					PF4	RMII1_REFCLK		
PA5	JTAG1_TDI			PC9	uart4_txd					PF5	RMII1_TXEN		
PAG	JTAG1_nTRST			PC10	UART4_RXD					PF6	RMII1_TXD1		
				PC11	LED_G					PF7	RMII1_TXD0		
				PC12	UART8_TXD					PF8	RMII1_MDIO		
				PC13	UART8_RXD					PF9	RMII1_MDC		
				PC14	UART8_RTS					PF11	uart0_rxd		
				PC15	button					PF12	UART0_TXD		

Figure 5-1 GPIO List Schematic



Figure 5-2 Power Schematic





5.5 Configure Schematic



Figure 5-5 Configure Schematic

5.6 PORT Schematic



Figure 5-6 PORT Schematic

R33 eMCmd VCC HOLD SCK eMCk] _____CMD0] IN3 eMDI eMD2 eMD3 cMWP cMWP **SPI Flash** eMD1 eMD0 cMClk VDD33 eMCmd eMD3 eMD2 +C31 SD CARD

5.7 Memory Schematic

Figure 5-7 Memory Schematic



5.8 Ethernet connector Schematic

DST

Figure 5-8 Ethernet connector Schematic



5.9 RS485 and CAN Schematic

Figure 5-9 RS485 and CAN Schematic

5.10 USB Hub



Figure 5-10 USB Hub



5.11 PCB Placement

Figure 5-11 Front PCB Placement

6 REVISION HISTORY

Date	Revision	Description
2021.08.26	1.00	1. Initial version