NuMicro® Family

Arm® Cortex®-M0-based Microcontroller

NuMaker-HMI-M032KI

User Manual

Evaluation Board for NuMicro® M032 Series

For additional information or questions, please contact: Nuvoton Technology Corporation.

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1 OVERVIEW

The NuMaker-HMI-M032KI consists of two parts, a NuTFT Kit Board and a NuMaker-M032KI board. The NuMaker-M032KI consists of an M032 target board and an on-board Nu-Link2-Me debugger and programmer. The NuMaker-HMI-M032KI allows users to quickly develop, easily program, and debug application.

The M032KI target board is based on NuMicro M032KIAAE. For the development flexibility, the M032KI target board provides the extension connectors, the Arduino UNO compatible headers and the capability of adopting multiple power supplies. Furthermore, the Nuvoton-designed ammeter connector can measure the power consumption instantly, which is essential for the prototype evaluation.

In addition, there is an attached on-board debugger and programmer “Nu-Link2-Me”. The Nu-Link2-Me supports on-chip debugging, online and offline ICP programming via SWD interface. The Nu-Link2-Me supports virtual COM (VCOM) port for printing debug messages on PC. Besides, the programming status could be shown on the built-in LEDs. Lastly, the Nu-Link2-Me could be detached from the evaluation board and become a stand-alone mass production programmer.

The NuTFT Kit Board is a daughter board that extends the NuMaker development boards. The NuTFT Kit Board requires NuMaker development board as mother board to create a GUI development platform. All Nuvoton NuMaker development boards support this kit board. It is designed for LCD display or GUI evaluation, prototype development and validation. Besides, Nuvoton provides emWin GUI library on NuMaker-NUC126 and NuMaker-M032KI. By using NuMaker-NUC126 or NuMaker-M032KI as the mother board, user can create a powerful and stunning graphics for the embedded system.

The NuTFT Kit Board is equipped with one SPI flash, one LCD panel with touch function, one five direction joystick and two push buttons. NuTFT Kit Board pin arrangement is compatible with Arduino UNO. The driver IC of the LCD panel is ILI9341, for more detailed information about the LCD panel, please refer to the ILI9341 datasheet.

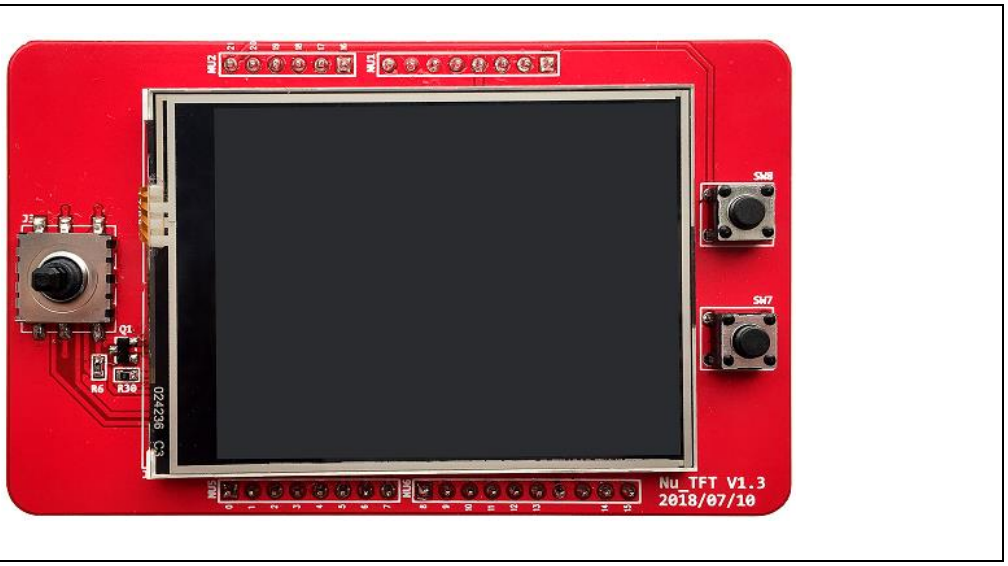


Figure 1-1 NuTFT Kit Board

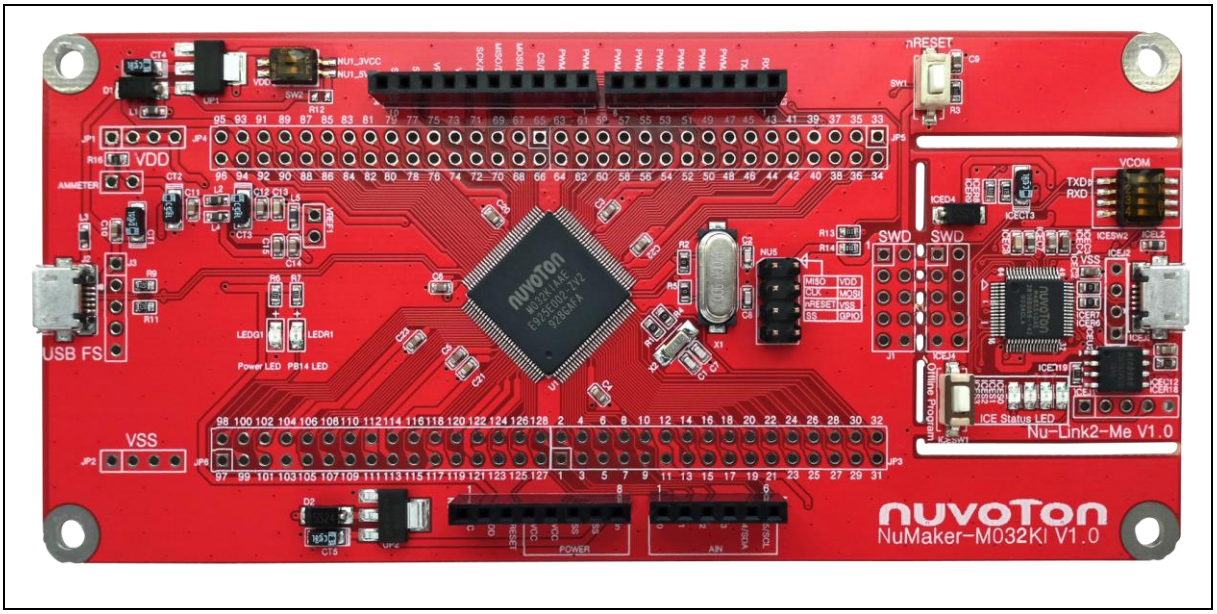


Figure 1-2 NuMaker-M032KI Board

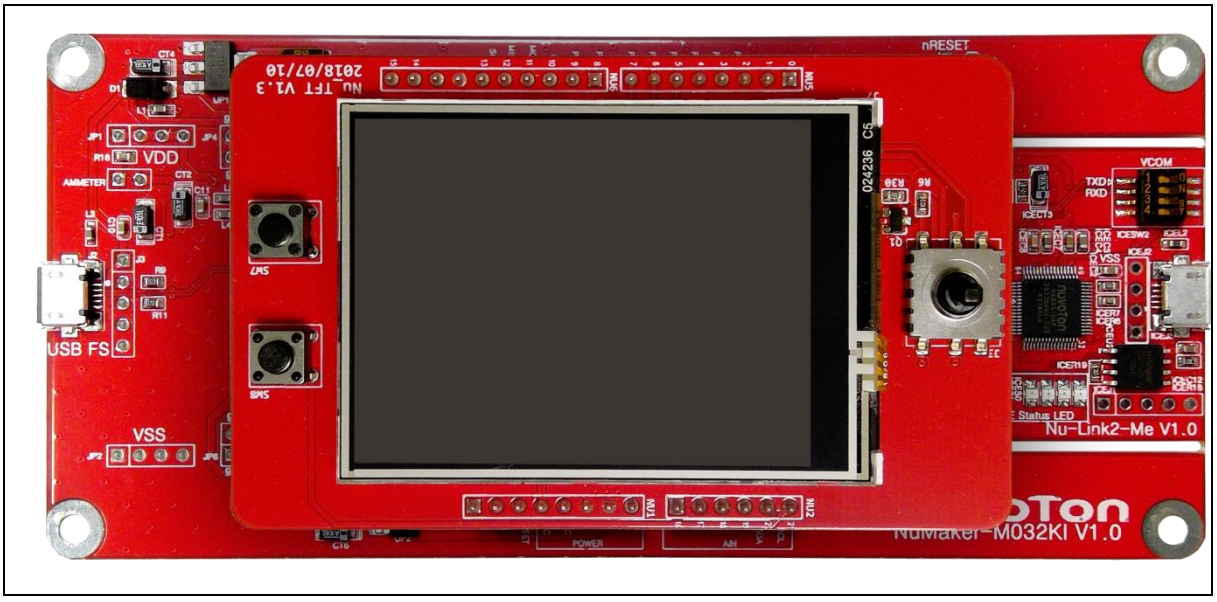


Figure 1-3 NuMaker-HMI-M032KI

2 FEATURES

2.1 NuTFT Kit Board Features

- 16 Mbits (2 MB) SPI Flash * 1 (W25Q16CV)
- 2.4” (320x240) LCD Panel with 4-Wire ADC Touch Function (LCD Driver is Ili9341)
- Five Direction Joystick * 1
- Push Botton * 2
- Arduino UNO compatible extension connectors

2.2 NuMaker-M032KI Features

- NuMicro M032KIAAE used as main microcontroller with function compatible with:
  - M032KIAAE
  - M032SIAAE
- M032KIAAE full pins extension connectors
- Arduino UNO compatible extension connectors
- Ammeter connector for measuring the microcontroller’s power consumption
- Flexible board power supply:
  - External V_{DD} power connector
  - Arduino UNO compatible extension connector Vin
  - USB FS connector on M032KI target board
  - ICE USB connector on Nu-Link2-Me
- On-board Nu-Link2-Me debugger and programmer:
  - Debug through SWD interface
  - Online/offline programming
  - Virtual COM port function

3 NUTFT KIT BOARD HARDWARE CONFIGURATION

3.1 Front View

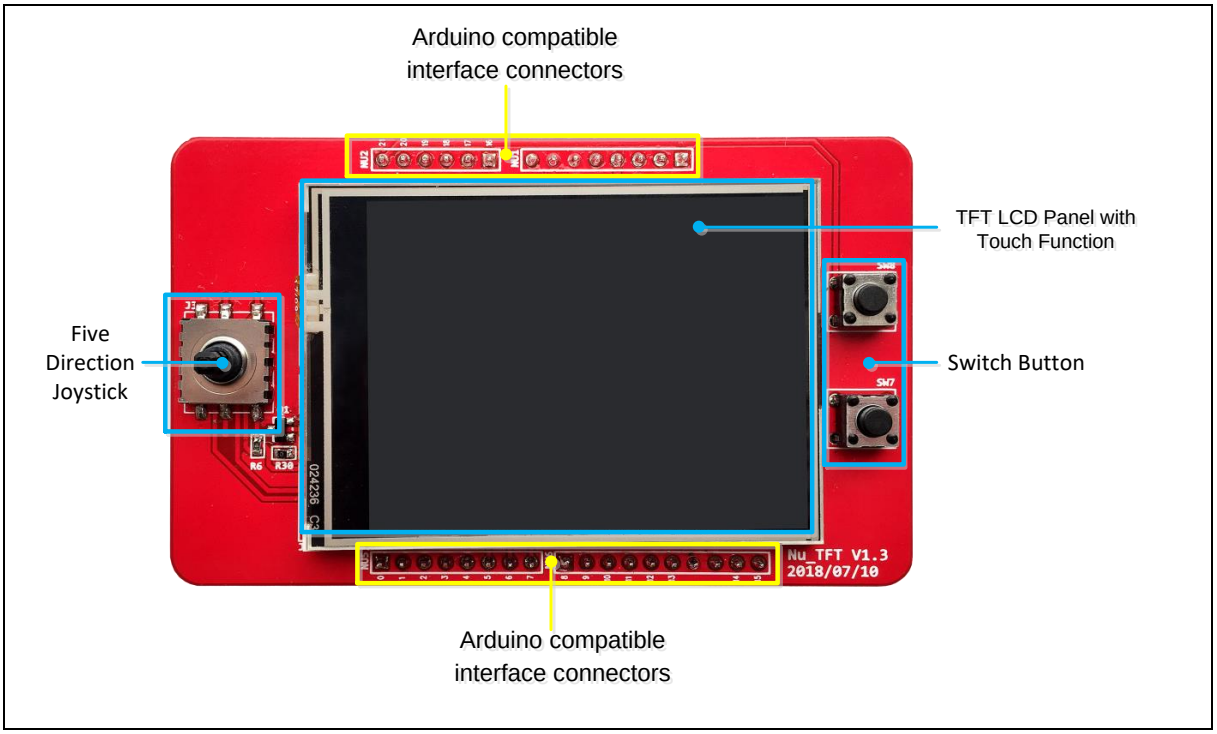


Figure 3-1 Front View of NuTFT Kit Board

Figure 3-1 shows the main components and connectors from the front side of NuTFT Kit Board. The following lists components and connectors from the front view:

- Five Direction Joystick (J3)
  - There are five dimensions: up, down, left, right and middle in five-direction joystick.
- Push Button (SW7 and SW8)
- 2.4” (320x240) LCD Panel with 4-Wire ADC Touch Function (LCD Driver is Ili9341) (J7)
  - This TFT LCD panel with 4-wire ADC touch function is equipped with driver IC, ILI9341.
  - LCD Control Interface: SPI
  - Touch Function Interface: ADC * 4
  - Panel Size: 2.4”
  - Panel Resolution: 320x240
- Arduino UNO Compatible Interface Connectors (NU1, NU2, NU5 and NU6)

3.2 Rear View

Figure 3-2 shows the main components and connectors from the rear side of NuTFT Kit Board.

The following lists components and connectors from the rear view:

- 16 Mbits (2 MB) SPI Flash * 1 (W25Q16CV) (U1)
- Arduino UNO Compatible Interface Connectors (NU1, NU2, NU5, NU6 and NU7)

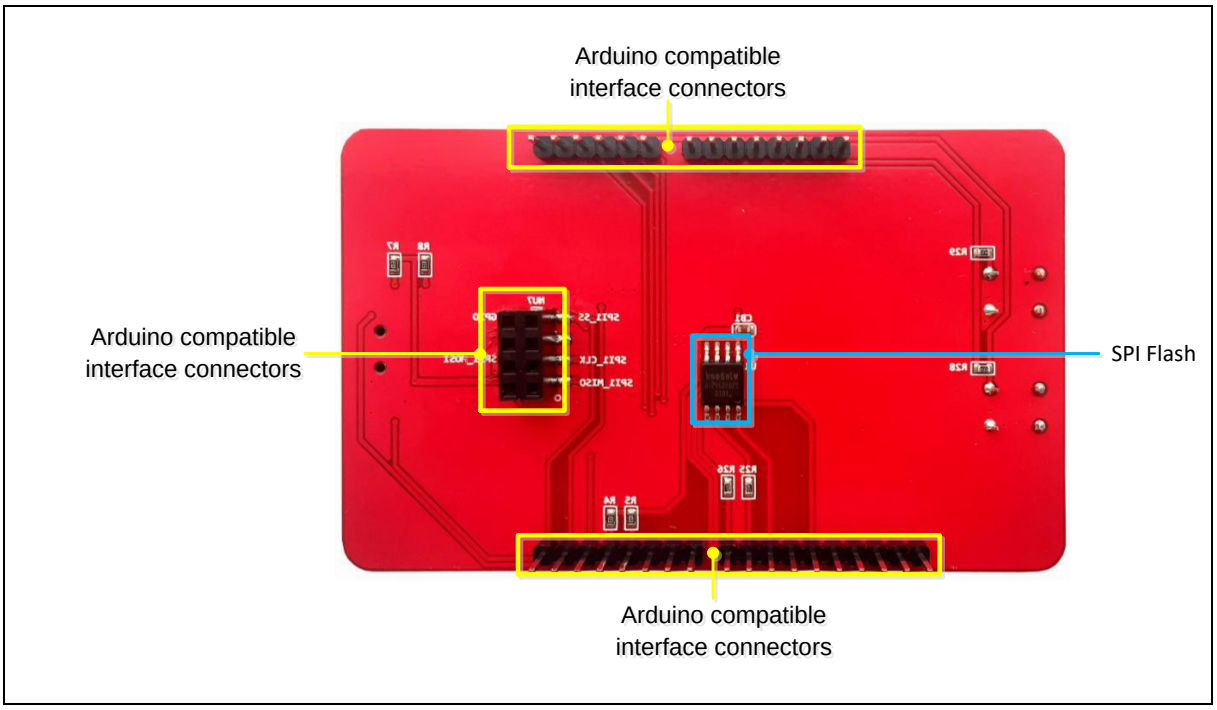


Figure 3-2 Rear View of NuTFT Kit Board

3.3 Extension Connectors

Pin Assignment for Extension Connectors

NuTFT Kit Board is equipped with one SPI flash, one LCD panel with touch function, one five direction joystick and two push buttons for developing and verifying some special feature. Besides, the pin arrangement of NuTFT Kit Board is compatible with Arduino UNO.

3.3.1

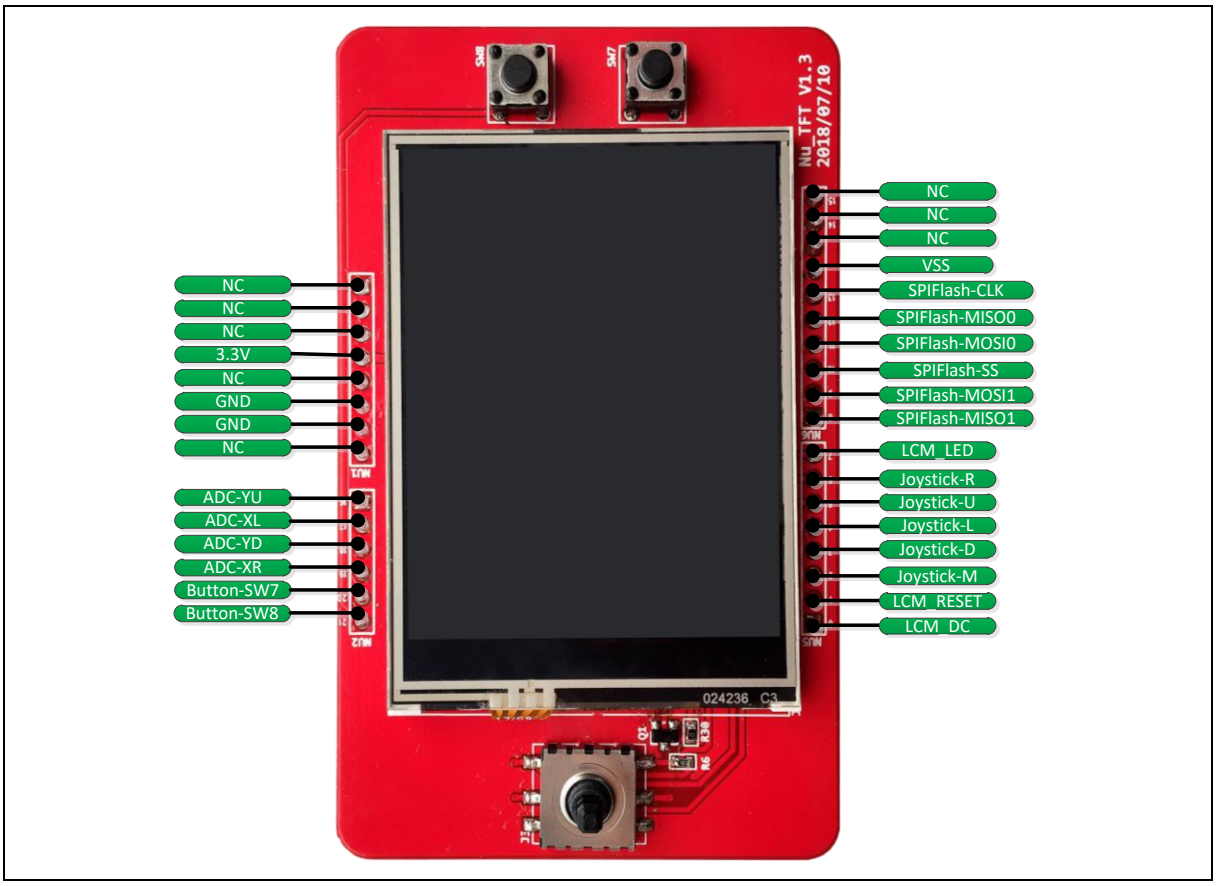


Figure 3-3 NuTFT Kit Board Extension Connectors – Front View

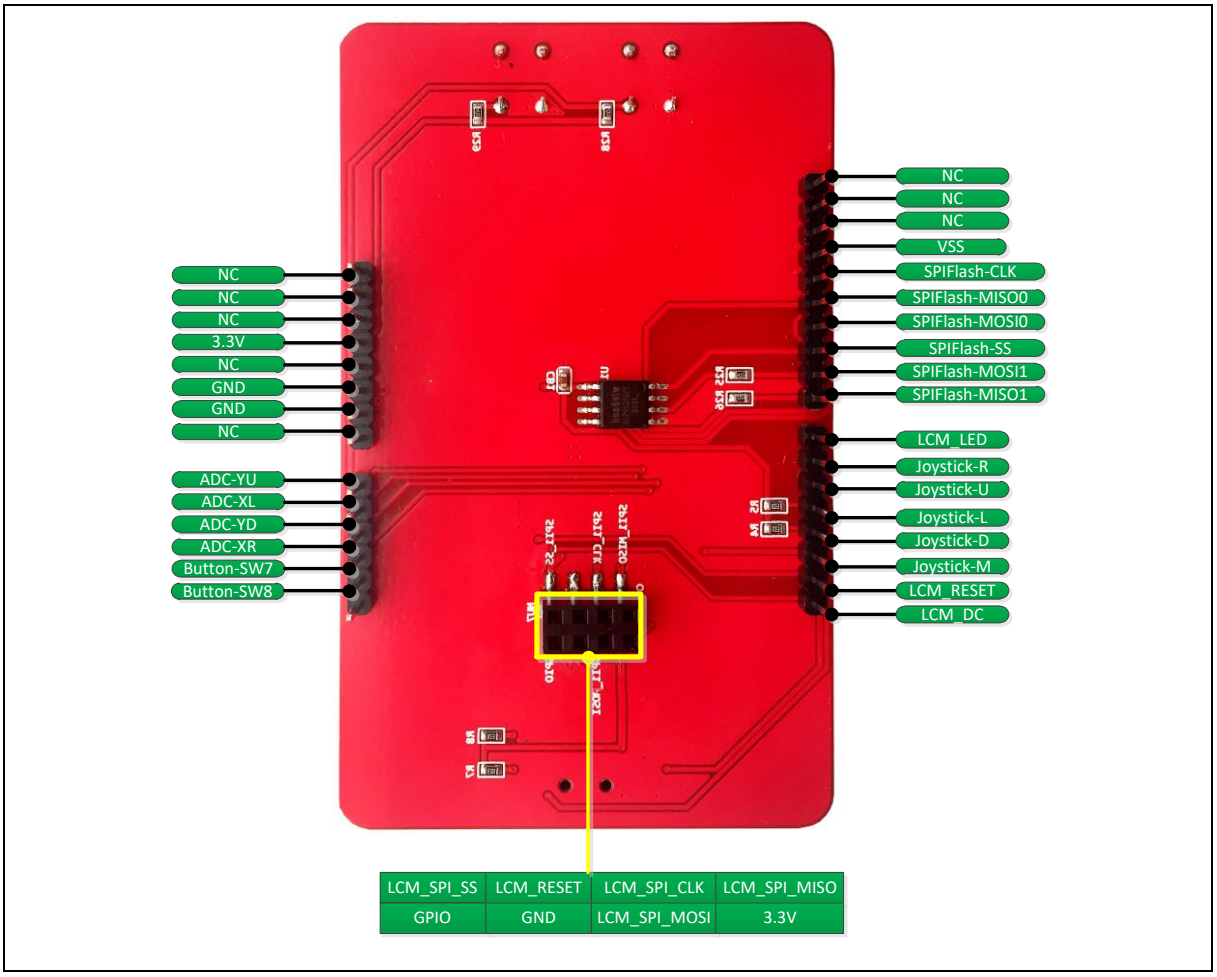


Figure 3-4 NuTFT Kit Board Connectors – Rear View

Pin Function Description

There is few different between NuMaker pin define and Arduino UNO pin define. The pin define of NU7 of Arduino is same as D11, D12, D13 (SPI function) and there is 1 set of SPI. The pin define of NU7 of NuMaker is another SPI function and there are 2 sets of SPI. If user wants to operate the NuTFT Kit Board on Arduino UNO, because it share one SPI, it recommends that control Flash and panel by switching the SPI Flash – SS0(D10) and LCM_SPI_SS.

3.3.2

Header	Arduino UNO Pin Define	NuMaker Pin Define	NuTFT Kit Board Function
NU1	NC	NC	NC
	IOREF	IOREF	NC
	RESET	RESET	NC
	3.3V	3.3V	Power for NuTFT Kit Board
	5V	5V	NC
	GND	GND	GND
	GND	GND	GND
	Vin	Vin	NC
NU2	A0	A0	4 wired ADC Touch Panel – YU
	A1	A1	4 wired ADC Touch Panel – XL
	A2	A2	4 wired ADC Touch Panel – YD
	A3	A3	4 wired ADC Touch Panel – XR
	A4	A4	SW7 Push Button
	A5	A5	SW8 Push Button
NU5	D0	D0	LCM_DC
	D1	D1	LCM_RESET
	D2	D2	Five direction joystick – Middle
	D3	D3	Five direction joystick – Down
	D4	D4	Five direction joystick – Left
	D5	D5	Five direction joystick – Up
	D6	D6	Five direction joystick – Right
	D7	D7	LCM_EN (PWM)

Table 3-1 NuTFT Kit Board Pin Function Description – NU1, NU2 and NU5

Header	Arduino UNO Pin Define	NuMaker Pin Define	NuTFT Kit Board Function
NU6	D8	D8	SPI Flash – MISO1
	D9	D9	SPI Flash – MOSI1
	D10	D10 (SPI0)	SPI Flash – SS0
	D11	D11 (SPI0)	SPI Flash – MOSI0
	D12	D12 (SPI0)	SPI Flash – MISO0
	D13	D13 (SPI0)	SPI Flash – CLK0
	GND	GND	GND
	AREF	AREF	NC
	SDA	SDA	NC
	SCL	SCL	NC
NU7	D12	SPI_MISO (SPI1)	LCM_SPI_MISO
	5V	5V	3.3V
	D13	SPI_CLK (SPI1)	LCM_SPI_CLK
	D11	SPI_MOSI (SPI1)	LCM_SPI_MOSI
	RESET	RESET	LCM Panel Reset
	GND	GND	GND
	--	SPI_SS (SPI1)	LCM_SPI_SS
	--	GPIO	GPIO

Table 3-2 NuTFT Kit Board Pin Function Description – NU6 and NU7

4 NUMAKER-M032KI HARDWARE CONFIGURATION

4.1 Front View

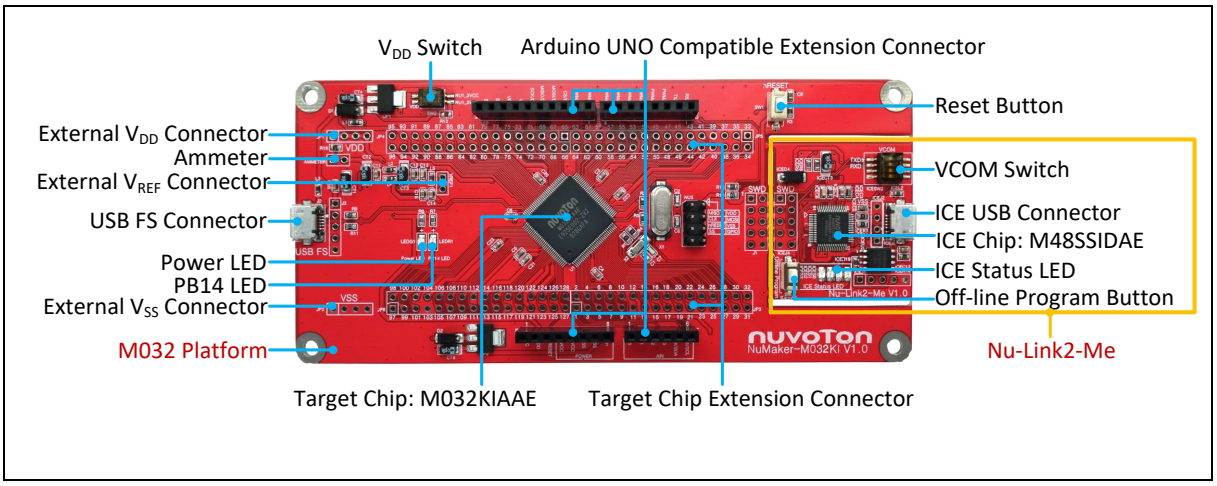


Figure 4-1 Front View of NuMaker-M032KI

Figure 4-1 shows the main components and connectors from the front side of NuMaker-M032KI. The following lists components and connectors from the front view:

- Target chip: M032KIAAE (U1)
- USB FS Connector (J2)
- Arduino UNO Compatible Extension Connectors (NU1, NU2, NU3, NU4)
- M032 Extension Connectors (JP3, JP4, JP5 and JP6)
- External V_{DD} Power Connector (JP1)
- External V_{SS} Power Connector (JP2)
- External V_{REF} Connector (VREF1)
- V_{DD} Switch (SW2)
- Ammeter Connector (AMMETER)
- Reset Button (SW1)
- Power LED and PB14 LED (LEDG1 and LEDR1)
- Nu-Link2-Me
  - VCOM Switch
  - ICE Chip: M48SSIDAE (ICEU2)
  - ICE USB Connector (ICEJ3)
  - ICE Status LED (ICES0, ICES1, ICES2, ICES3)
  - Off-line Program Button (ICESW1)

4.2 Rear View

Figure 4-2 shows the main components and connectors from the rear side of NuMaker-M032KI.

The following lists components and connectors from the rear view:

- Nu-Link2-Me
  - MCUVCC Power Switch (ICEJPR1)
  - ICEVCC Power Switch (ICEJPR2)

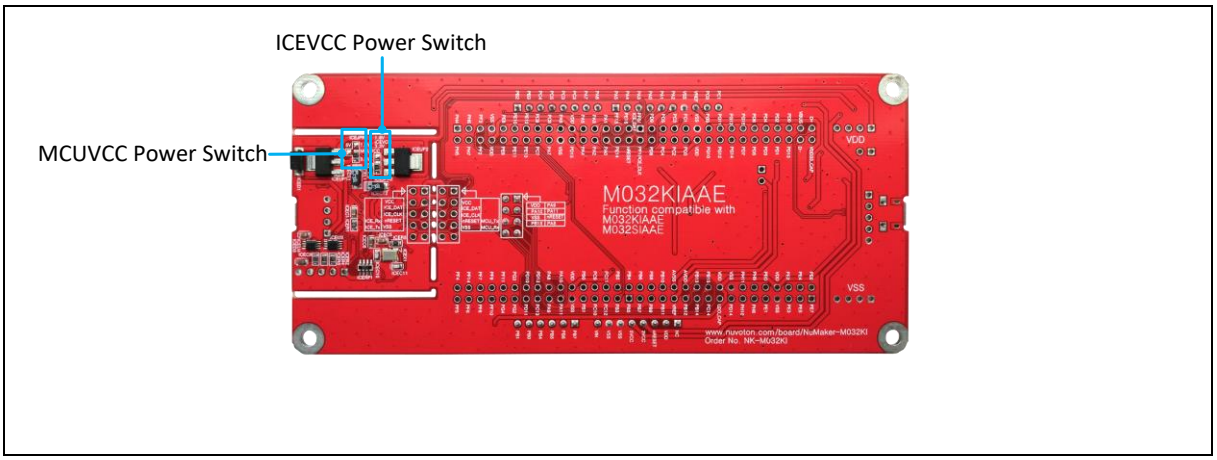


Figure 4-2 Rear View of NuMaker-M032KI

4.3 Extension Connectors

Table 4-1 presents the extension connectors.

Connector	Description
JP3, JP4, JP5 and JP6	Full pins extension connectors on the NuMaker-M032KI.
NU1, NU2, NU3 and NU4	Arduino UNO compatible pins on the NuMaker-M032KI.

Table 4-1 Extension Connectors

4.3.1 Pin Assignment for Extension Connectors

The NuMaker-M032KI provides the M032KIAAE onboard and extension connectors (JP3, JP4, JP5 and JP6). Figure 4-3 shows the M032KIAAE extension connectors.

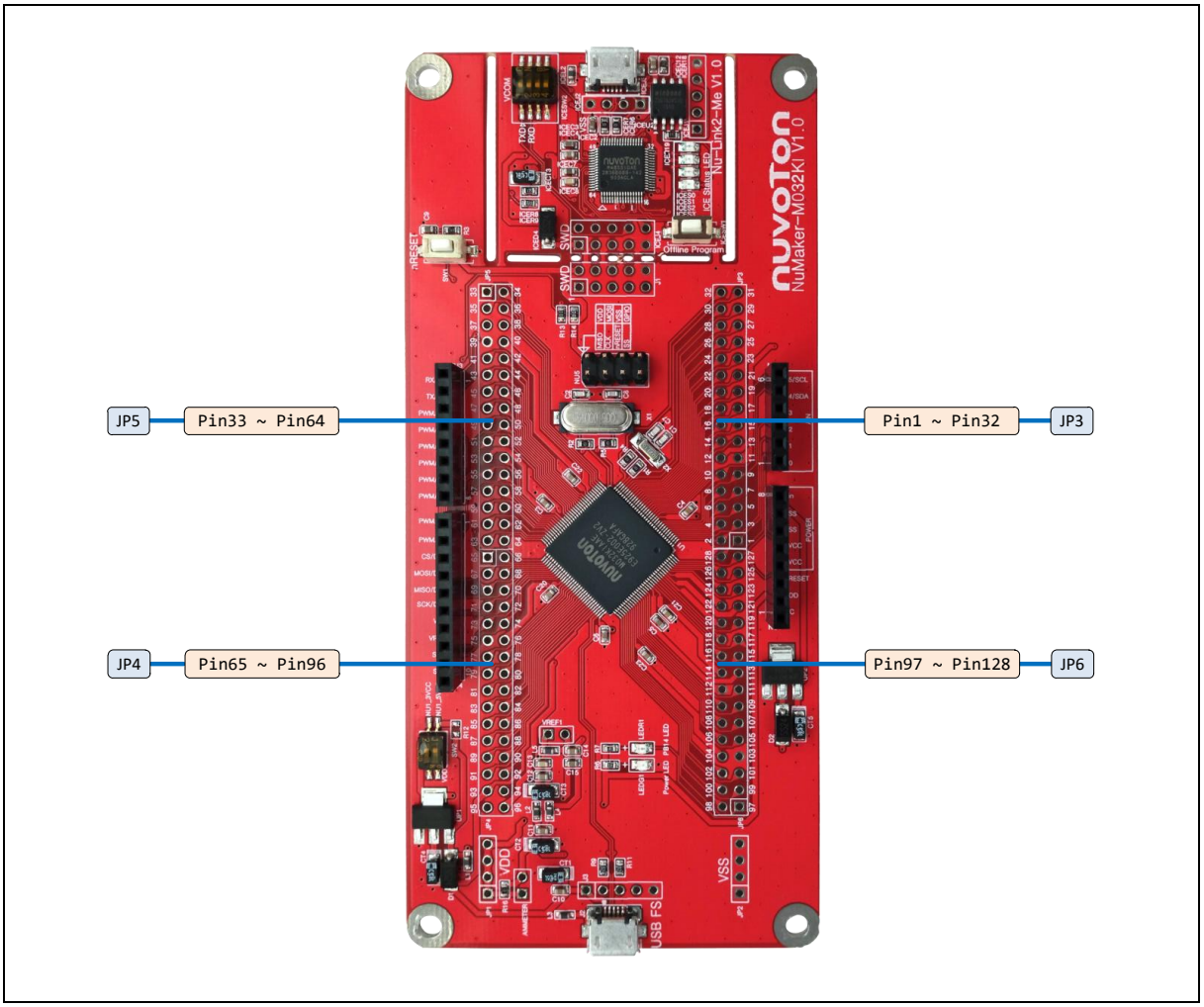


Figure 4-3 M032KIAAE Extension Connectors

Header		M032KIAAE	
		Pin No.	Function
JP3	JP3.1	1	PB.5/ADC0_CH5/ACMP1_N/EBI_ADR0/I2C0_SCL/UART5_TXD/USCI1_CTL0/PWM0_CH0/UART2_TXD/TM0/INT0
	JP3.2	2	PB.4/ADC0_CH4/ACMP1_P1/EBI_ADR1/I2C0_SDA/UART5_RXD/USCI1_CTL1/PWM0_CH1/UART2_RXD/TM1/INT1
	JP3.3	3	PB.3/ADC0_CH3/ACMP0_N/EBI_ADR2/I2C1_SCL/UART1_TXD/UART5_nRTS/USCI1_DAT1/PWM0_CH2/PWM0_BRAKE0/TM2/INT2
	JP3.4	4	PB.2/ADC0_CH2/ACMP0_P1/EBI_ADR3/I2C1_SDA/UART1_RXD/UART5_nCTS/USCI1_DAT0/PWM0_CH3/TM3/INT3
	JP3.5	5	PC.12/EBI_ADR4/UART0_TXD/I2C0_SCL/UART6_TXD/PWM1_CH0/ACMP0_O
	JP3.6	6	PC.11/EBI_ADR5/UART0_RXD/I2C0_SDA/UART6_RXD/PWM1_CH1/ACMP1_O
	JP3.7	7	PC.10/EBI_ADR6/UART6_nRTS/UART3_TXD/PWM1_CH2
	JP3.8	8	PC.9/EBI_ADR7/UART6_nCTS/UART3_RXD/PWM1_CH3
	JP3.9	9	PB.1/ADC0_CH1/EBI_ADR8/UART2_TXD/USCI1_CLK/I2C1_SCL/QSPI0_MISO1/PWM0_CH4/PWM1_CH4/PWM0_BRAKE0
	JP3.10	10	PB.0/ADC0_CH0/EBI_ADR9/UART2_RXD/SPI0_I2SMCLK/I2C1_SDA/QSPI0_MOSI1/PWM0_CH5/PWM1_CH5/PWM0_BRAKE1
	JP3.11	11	V_{SS}
	JP3.12	12	V_{DD}
	JP3.13	13	PA.11/ACMP0_P0/EBI_nRD/USCI0_CLK/UART6_TXD/BPWM0_CH0/TM0_EXT
	JP3.14	14	PA.10/ACMP1_P0/EBI_nWR/USCI0_DAT0/UART6_RXD/BPWM0_CH1/TM1_EXT
	JP3.15	15	PA.9/EBI_MCLK/USCI0_DAT1/UART1_TXD/UART7_TXD/BPWM0_CH2/TM2_EXT
	JP3.16	16	PA.8/EBI_ALE/USCI0_CTL1/UART1_RXD/UART7_RXD/BPWM0_CH3/TM3_EXT/INT4
	JP3.17	17	PC.13/EBI_ADR10/USCI0_CTL0/UART2_TXD/BPWM0_CH4/CLKO/ADC0_ST
	JP3.18	18	PD.12/EBI_nCS0/UART2_RXD/BPWM0_CH5/CLKO/ADC0_ST/INT5
	JP3.19	19	PD.11/EBI_nCS1/UART1_TXD
	JP3.20	20	PD.10/UART1_RXD
	JP3.21	21	PG.2/EBI_ADR11/I2C0_SMBAL/I2C1_SCL/TM0
	JP3.22	22	PG.3/EBI_ADR12/I2C0_SMBSUS/I2C1_SDA/TM1
	JP3.23	23	PG.4/EBI_ADR13/TM2
	JP3.24	24	PF.11/EBI_ADR14/UART5_TXD/TM3
	JP3.25	25	PF.10/EBI_ADR15/SPI0_I2SMCLK/UART5_RXD
	JP3.26	26	PF.9/EBI_ADR16/SPI0_SS/UART5_nRTS
	JP3.27	27	PF.8/EBI_ADR17/SPI0_CLK/UART5_nCTS
	JP3.28	28	PF.7/EBI_ADR18/SPI0_MISO/UART4_TXD
	JP3.29	29	PF.6/EBI_ADR19/SPI0_MOSI/UART4_RXD/EBI_nCS0
	JP3.30	30	PF.14/PWM1_BRAKE0/PWM0_BRAKE0/PWM0_CH4/CLKO/TM3/INT5
	JP3.31	31	PF.5/UART2_RXD/UART2_nCTS/PWM0_CH0/BPWM0_CH4/X32_IN/ADC0_ST
	JP3.32	32	PF.4/UART2_TXD/UART2_nRTS/PWM0_CH1/BPWM0_CH5/X32_OUT
JP5	JP5.1	33	PH.4/EBI_ADR3/UART7_nRTS/UART6_TXD

Header		M032KIAAE	
		Pin No.	Function
	JP5.2	34	PH.5/EBI_ADR2/UART7_nCTS/UART6_RXD
	JP5.3	35	PH.6/EBI_ADR1/UART7_TXD
	JP5.4	36	PH.7/EBI_ADR0/UART7_RXD
	JP5.5	37	PF.3/EBI_nCS0/UART0_TXD/I2C0_SCL/XT1_IN/BPWM1_CH0
	JP5.6	38	PF.2/EBI_nCS1/UART0_RXD/I2C0_SDA/QSPI0_CLK/XT1_OUT/BPWM1_CH1
	JP5.7	39	V_{SS}
	JP5.8	40	V_{DD}
	JP5.9	41	PE.8/EBI_ADR10/USCI1_CTL1/UART2_TXD/PWM0_CH0/PWM0_BRAKE0
	JP5.10	42	PE.9/EBI_ADR11/USCI1_CTL0/UART2_RXD/PWM0_CH1/PWM0_BRAKE1
	JP5.11	43	PE.10/EBI_ADR12/USCI1_DAT0/UART3_TXD/PWM0_CH2/PWM1_BRAKE0
	JP5.12	44	PE.11/EBI_ADR13/USCI1_DAT1/UART3_RXD/UART1_nCTS/PWM0_CH3/PWM1_BRAKE1
	JP5.13	45	PE.12/EBI_ADR14/USCI1_CLK/UART1_nRTS/PWM0_CH4
	JP5.14	46	PE.13/EBI_ADR15/I2C0_SCL/UART4_nRTS/UART1_TXD/PWM0_CH5/PWM1_CH0/BPWM1_CH5
	JP5.15	47	PC.8/EBI_ADR16/I2C0_SDA/UART4_nCTS/UART1_RXD/PWM1_CH1/BPWM1_CH4
	JP5.16	48	PC.7/EBI_AD9/UART4_TXD/UART0_nCTS/UART6_TXD/PWM1_CH2/BPWM1_CH0/TM0/INT3
	JP5.17	49	PC.6/EBI_AD8/UART4_RXD/UART0_nRTS/UART6_RXD/PWM1_CH3/BPWM1_CH1/TM1/INT2
	JP5.18	50	PA.7/EBI_AD7/UART0_TXD/I2C1_SCL/PWM1_CH4/BPWM1_CH2/ACMP0_WLAT/TM2/INT1
	JP5.19	51	PA.6/EBI_AD6/UART0_RXD/I2C1_SDA/PWM1_CH5/BPWM1_CH3/ACMP1_WLAT/TM3/INT0
	JP5.20	52	V_{SS}
	JP5.21	53	V_{DD}
	JP5.22	54	PD.15/PWM0_CH5/TM3/INT1
	JP5.23	55	PA.5/QSPI0_MISO1/UART0_nCTS/UART0_TXD/I2C0_SCL/UART5_TXD/BPWM0_CH5/PWM0_CH0
	JP5.24	56	PA.4/QSPI0_MOSI1/SPI0_I2SMCLK/UART0_nRTS/UART0_RXD/I2C0_SDA/UART5_RXD/BPWM0_CH4/PWM0_CH1
	JP5.25	57	PA.3/QSPI0_SS/SPI0_SS/UART4_TXD/I2C0_SMBAL/UART1_TXD/I2C1_SCL/BPWM0_CH3/PWM0_CH2/CLKO/PWM1_BRAKE1
	JP5.26	58	PA.2/QSPI0_CLK/SPI0_CLK/UART4_RXD/I2C0_SMBSUS/UART1_RXD/I2C1_SDA/BPWM0_CH2/PWM0_CH3
	JP5.27	59	PA.1/QSPI0_MISO0/SPI0_MISO/UART0_TXD/UART1_nCTS/BPWM0_CH1/PWM0_CH4
	JP5.28	60	PA.0/QSPI0_MOSI0/SPI0_MOSI/UART0_RXD/UART1_nRTS/BPWM0_CH0/PWM0_CH5
	JP5.29	61	PF.15/PWM0_BRAKE0/PWM0_CH1/TM2/CLKO/INT4
	JP5.30	62	PE.14/EBI_AD8/UART2_TXD/UART6_TXD
	JP5.31	63	PE.15/EBI_AD9/UART2_RXD/UART6_RXD
	JP5.32	64	nRESET
JP4	JP4.1	65	PF.0/UART1_TXD/I2C1_SCL/UART0_TXD/BPWM1_CH0/ICE_DAT
	JP4.2	66	PF.1/UART1_RXD/I2C1_SDA/UART0_RXD/BPWM1_CH1/ICE_CLK
	JP4.3	67	PD.9/EBI_AD7/UART2_nCTS/UART7_TXD

Header		M032KIAAE	
		Pin No.	Function
	JP4.4	68	PD.8/EBI_AD6/UART2_nRTS/UART7_RXD
	JP4.5	69	PC.5/EBI_AD5/QSPI0_MISO1/UART2_TXD/I2C1_SCL/UART4_TXD/PWM1_CH0
	JP4.6	70	PC.4/EBI_AD4/QSPI0_MOSI1/UART2_RXD/I2C1_SDA/UART4_RXD/PWM1_CH1
	JP4.7	71	PC.3/EBI_AD3/QSPI0_SS/UART2_nRTS/I2C0_SMBAL/UART3_TXD/PWM1_CH2
	JP4.8	72	PC.2/EBI_AD2/QSPI0_CLK/UART2_nCTS/I2C0_SMBSUS/UART3_RXD/PWM1_CH3
	JP4.9	73	PC.1/EBI_AD1/QSPI0_MISO0/UART2_TXD/I2C0_SCL/PWM1_CH4/ACMP0_O/ADC0_ST
	JP4.10	74	PC.0/EBI_AD0/QSPI0_MOSI0/UART2_RXD/I2C0_SDA/PWM1_CH5/ACMP1_O
	JP4.11	75	V_{SS}
	JP4.12	76	V_{DD}
	JP4.13	77	PG.9/EBI_AD0/BPWM0_CH5
	JP4.14	78	PG.10/EBI_AD1/BPWM0_CH4
	JP4.15	79	PG.11/EBI_AD2/UART7_TXD/BPWM0_CH3
	JP4.16	80	PG.12/EBI_AD3/UART7_RXD/BPWM0_CH2
	JP4.17	81	PG.13/EBI_AD4/UART6_TXD/BPWM0_CH1
	JP4.18	82	PG.14/EBI_AD5/UART6_RXD/BPWM0_CH0
	JP4.19	83	PG.15/CLKO/ADC0_ST
	JP4.20	84	PD.7/UART1_TXD/I2C0_SCL/USCI1_CLK
	JP4.21	85	PD.6/UART1_RXD/I2C0_SDA/USCI1_DAT1
	JP4.22	86	PD.5/I2C1_SCL/USCI1_DAT0
	JP4.23	87	PD.4/USCI0_CTL0/I2C1_SDA/USCI1_CTL1
	JP4.24	88	PD.3/EBI_AD10/USCI0_CTL1/SPI0_SS/UART3_nRTS/USCI1_CTL0/UART0_TXD
	JP4.25	89	PD.2/EBI_AD11/USCI0_DAT1/SPI0_CLK/UART3_nCTS/UART0_RXD
	JP4.26	90	PD.1/EBI_AD12/USCI0_DAT0/SPI0_MISO/UART3_TXD
	JP4.27	91	PD.0/EBI_AD13/USCI0_CLK/SPI0_MOSI/UART3_RXD/TM2
	JP4.28	92	PD.13/EBI_AD10/SPI0_I2SMCLK
	JP4.29	93	PA.12/UART4_TXD/I2C1_SCL/BPWM1_CH2
	JP4.30	94	PA.13/UART4_RXD/I2C1_SDA/BPWM1_CH3
	JP4.31	95	PA.14/UART0_TXD/BPWM1_CH4
	JP4.32	96	PA.15/UART0_RXD/BPWM1_CH5
JP6	JP6.1	97	PE.7/UART5_TXD/PWM0_CH0/BPWM0_CH5
	JP6.2	98	PE.6/USCI0_CTL0/UART5_RXD/PWM0_CH1/BPWM0_CH4
	JP6.3	99	PE.5/EBI_nRD/USCI0_CTL1/UART6_TXD/UART7_nRTS/PWM0_CH2/BPWM0_CH3
	JP6.4	100	PE.4/EBI_nWR/USCI0_DAT1/UART6_RXD/UART7_nCTS/PWM0_CH3/BPWM0_CH2
	JP6.5	101	PE.3/EBI_MCLK/USCI0_DAT0/UART6_nRTS/UART7_TXD/PWM0_CH4/BPWM0_CH1
	JP6.6	102	PE.2/EBI_ALE/USCI0_CLK/UART6_nCTS/UART7_RXD/PWM0_CH5/BPWM0_CH0

Header		M032KIAAE	
		Pin No.	Function
	JP6.7	103	V_{SS}
	JP6.8	104	V_{DD}
	JP6.9	105	PE.1/EBI_AD10/QSPI0_MISO0/UART3_TXD/I2C1_SCL/UART4_nCTS
	JP6.10	106	PE.0/EBI_AD11/QSPI0_MOSI0/UART3_RXD/I2C1_SDA/UART4_nRTS
	JP6.11	107	PH.8/EBI_AD12/QSPI0_CLK/UART3_nRTS/UART1_TXD
	JP6.12	108	PH.9/EBI_AD13/QSPI0_SS/UART3_nCTS/UART1_RXD
	JP6.13	109	PH.10/EBI_AD14/QSPI0_MISO1/UART4_TXD/UART0_TXD
	JP6.14	110	PH.11/EBI_AD15/QSPI0_MOSI1/UART4_RXD/UART0_RXD/PWM0_CH5
	JP6.15	111	PD.14/EBI_nCS0/SPI0_I2SMCLK/USCI0_CTL0/PWM0_CH4
	JP6.16	112	V_{SS}
	JP6.17	113	LDO_CAP
	JP6.18	114	V_{DD}
	JP6.19	115	PC.14/EBI_AD11/SPI0_I2SMCLK/USCI0_CTL0/QSPI0_CLK/TM1
	JP6.20	116	PB.15/ADC0_CH15/EBI_AD12/SPI0_SS/USCI0_CTL1/UART0_nCTS/UART3_TXD/PWM1_CH0/TM0_EXT/PWM0_BRAKE1
	JP6.21	117	PB.14/ADC0_CH14/EBI_AD13/SPI0_CLK/USCI0_DAT1/UART0_nRTS/UART3_RXD/PWM1_CH1/TM1_EXT/CLKO
	JP6.22	118	PB.13/ADC0_CH13/ACMP0_P3/ACMP1_P3/EBI_AD14/SPI0_MISO/USCI0_DAT0/UART0_TXD/UART3_nRTS/PWM1_CH2/TM2_EXT
	JP6.23	119	PB.12/ADC0_CH12/ACMP0_P2/ACMP1_P2/EBI_AD15/SPI0_MOSI/USCI0_CLK/UART0_RXD/UART3_nCTS/PWM1_CH3/TM3_EXT
	JP6.24	120	AV_{DD}
	JP6.25	121	V_{REF}
	JP6.26	122	AV_{SS}
	JP6.27	123	PB.11/ADC0_CH11/EBI_ADR16/UART0_nCTS/UART4_TXD/I2C1_SCL/SPI0_I2SMCLK/BPWM1_CH0
	JP6.28	124	PB.10/ADC0_CH10/EBI_ADR17/USCI1_CTL0/UART0_nRTS/UART4_RXD/I2C1_SDA/BPWM1_CH1
	JP6.29	125	PB.9/ADC0_CH9/EBI_ADR18/USCI1_CTL1/UART0_TXD/UART1_nCTS/UART7_TXD/BPWM1_CH2
	JP6.30	126	PB.8/ADC0_CH8/EBI_ADR19/USCI1_CLK/UART0_RXD/UART1_nRTS/UART7_RXD/BPWM1_CH3
	JP6.31	127	PB.7/ADC0_CH7/EBI_nWRL/USCI1_DAT0/UART1_TXD/EBI_nCS0/BPWM1_CH4/PWM1_BRAKE0/PWM1_CH4/INT5/ACMP0_O
	JP6.32	128	PB.6/ADC0_CH6/EBI_nWRH/USCI1_DAT1/UART1_RXD/EBI_nCS1/BPWM1_CH5/PWM1_BRAKE1/PWM1_CH5/INT4/ACMP1_O

Table 4-2 M032KIAAE Full-pin Extension Connectors and GPIO Function List

4.3.2 Arduino UNO Compatible Extension Connectors

Figure 4-4 shows the Arduino UNO compatible extension connectors.

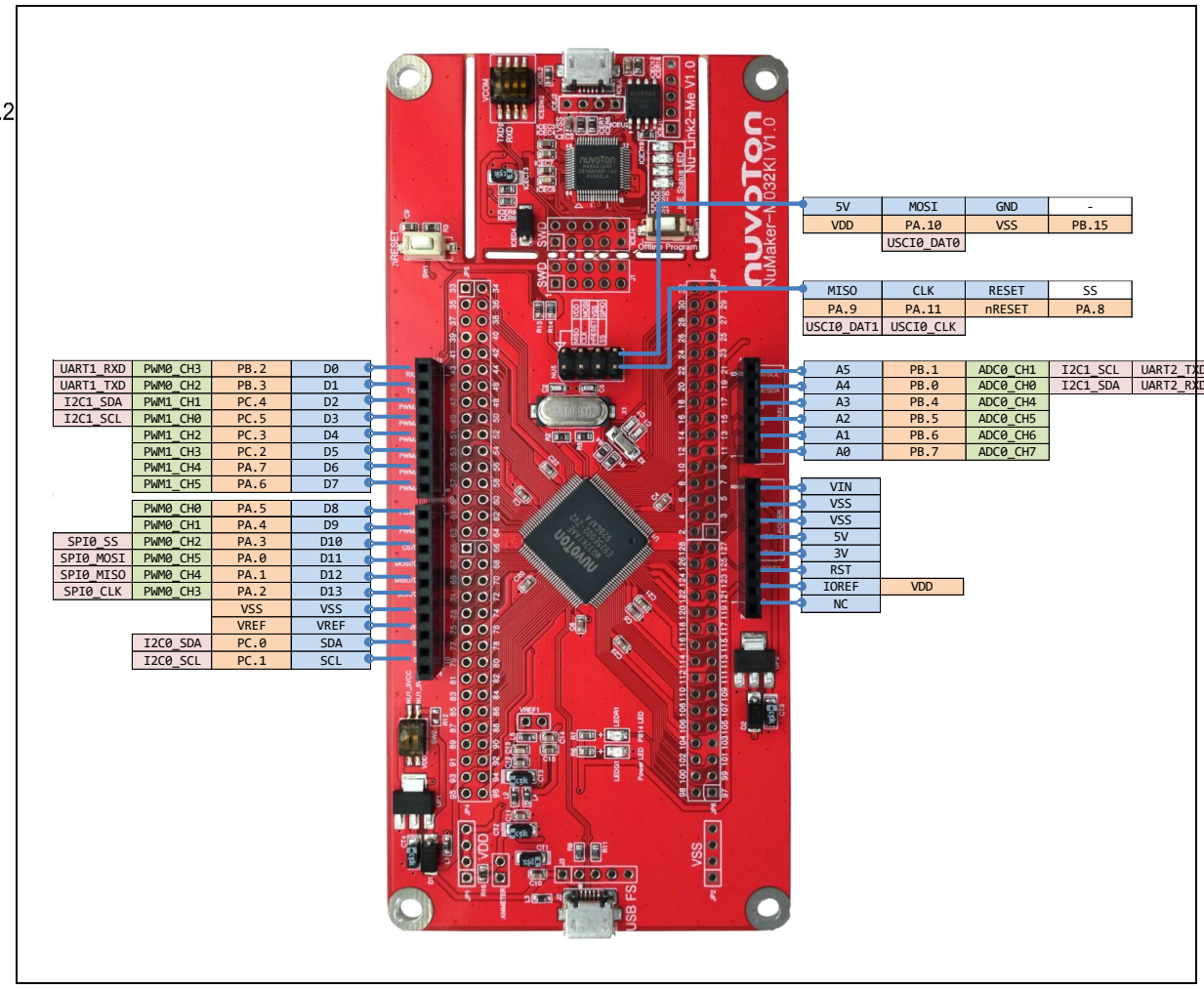


Figure 4-4 Arduino UNO Compatible Extension Connectors

Header		NuMaker-M032KI		Header		NuMaker-M032KI	
		Compatible to Arduino UNO	GPIO Pin of M032			Compatible to Arduino UNO	GPIO Pin of M032
NU3	NU3.1	D0	PB.2	NU2	NU2.6	A5	PB.1
	NU3.2	D1	PB.3		NU2.5	A4	PB.0
	NU3.3	D2	PC.4		NU2.4	A3	PB.4
	NU3.4	D3	PC.5		NU2.3	A2	PB.5
	NU3.5	D4	PC.3		NU2.2	A1	PB.6
	NU3.6	D5	PC.2		NU2.1	A0	PB.7
	NU3.7	D6	PA.7	NU1	NU1.8	VIN	-
	NU3.8	D7	PA.6		NU1.7	VSS	
NU4	NU4.1	D8	PA.5		NU1.6	VSS	
	NU4.2	D9	PA.4		NU1.5	5V	
	NU4.3	D10	PA.3		NU1.4	3V	
	NU4.4	D11	PA.0		NU1.3	RST	nRESET
	NU4.5	D12	PA.1		NU1.2	IOREF	V_{REF}
	NU4.6	D13	PA.2		NU1.1	NC	-
	NU4.7	VSS	V_{SS}				
	NU4.8	VREF	V_{REF}				
	NU4.9	SDA	PC.0				
	NU4.10	SCL	PC.1				

Table 4-3 Arduino UNO Extension Connectors and M032KIAAE Mapping GPIO List

4.4 Power Supply Configuration

The NuMaker-M032KI is able to adopt multiple power supplies. External power sources include NU1 Vin (7 V to 12 V), V_{DD} (depending on the target chip operating voltage), and PC through USB connector. By using switches and voltage regulator, multiple power domains can be created on the NuMaker-M032KI.

4.4.1 VIN Power Source

Table 4-4 presents the Vin power source.

Connector	Net Name in Schematic	Description
NU1 pin8	NU1_VIN	Board external power source, with voltage range from 7 V to 12 V. The voltage regulator UP2 converts the NU1 pin8 input voltage to 5 V and supplies it to NU1_5VCC.

Table 4-4 Vin Power Source

4.4.2 5 V Power Sources

Table 4-5 presents the 5 V power sources.

Connector	Net Name in Schematic	Description
ICEJ3	USB_HS_VBUS	ICE USB connector supplies 5 V power from PC to M032KI target board and Nu-Link2-Me.
J2	USB_VBUS	USB connector on NuMaker-M032KI supplies 5 V power from PC to M032KI target board and Nu-Link2-Me.
NU1 pin5	NU1_5VCC	ICEJ3, J2 or NU1 pin8 supplies 5 V power to NU1 pin5. NU1 pin5 supplies 5 V power to target chip or Arduino adapter board. **Note:** M032 operating voltage range is from 1.8 V to 3.6 V. Do not switch SW2.1 (NU1 5VCC) to ON.

Table 4-5 5 V Power Sources

3.3 V Power Sources

Table 4-6 presents the 3.3 V power sources.

Voltage Regulator	5 V Source	Description
ICEUP1	USB_HS_VBUS	ICEUP1 converts USB_HS_VBUS to 3.3 V and supplies 3.3 V to M032KI target board or ICE chip.
UP1	USB_VBUS	UP1 converts USB_VBUS to 3.3 V and supplies 3.3 V to M032KI target board. **Note:** SW2.2 (NU1 3VCC) should be switched to ON.
UP1	NU1_5VCC	UP1 converts NU1_5VCC to 3.3 V and supplies 3.3 V to M032KI target board. **Note:** SW2.2 (NU1 3VCC) should be switched to ON.

Table 4-6 3.3 V Power Sources

4.4.3

1.8 V Power Sources

4.4.4 Table 4-7 presents the 1.8 V power source.

Voltage Regular	5V Source	Description
ICEUP2	USB_HS_VBUS	ICEUP2 converts USB_HS_VBUS to 1.8 V and supplies 1.8 V to M032KI target board or ICE chip.

Table 4-7 1.8 V Power Sources

4.4.5

Power Connectors

Table 4-8 presents the power connectors.

Connector	Description
JP1	V_{DD} connector on the NuMaker-M032KI. **Note:** M032 operating voltage range is from 1.8 V to 3.6 V.
JP2	V_{SS} connector on the NuMaker-M032KI.

Table 4-8 Power Connectors

USB Connectors

Table 4-9 presents the USB connectors.

Connector	Description
ICEJ3	ICE USB connector on Nu-Link2-Me for power supply, debugging and programming from PC.
J2	USB FS connector on NuMaker-M032KI for power supply.

Table 4-9 USB Connectors

4.4.6

Power Switches

Table 4-10 presents the power switches.

4.4.7

Switch	Description
ICEJPR1	Configures the target chip operating voltage at 1.8 V / 3.3 V / 5 V. **Note:** M032 operating voltage range is from 1.8 V to 3.6 V. Do not switch ICEJPR1 (MCUVCC) to 5 V.
ICEJPR2	Configures the ICE chip operating voltage at 1.8 V / 3.3 V.
SW2	Configures the target chip operating voltage at 3.3 V / 5 V. **Note:** M032 operating voltage range is from 1.8 V to 3.6 V. Do not switch SW2.1 (NU1 5VCC) to ON.

Table 4-10 Power Switches

4.4.8

4.4.8.1

Power Supply Models

External Power Supply through Nu-Link2-Me to Target Chip

The external power supply source on Nu-Link2-Me is shown in Figure 4-5.

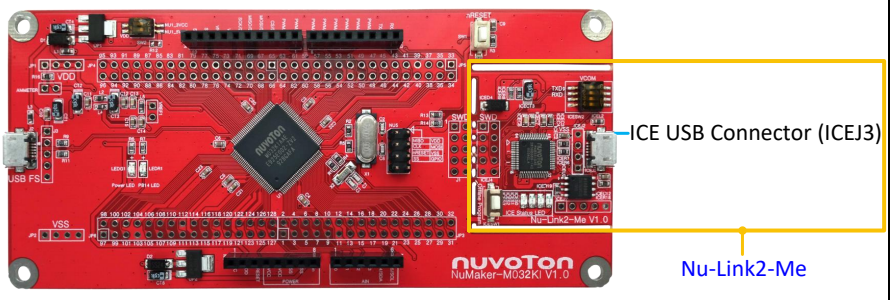


Figure 4-5 External Power Supply Sources on Nu-Link2-Me

To use ICEJ3 as external power supply source with Nu-Link2-Me, please follow the steps below:

Solder the resistor on ICEJPR1 (MCUVCC) depending on the target chip operating voltage.

Solder the resistor on ICEJPR2 (ICEVCC) depending on the ICE chip operating voltage.

Switch the SW2 to OFF.

Connect the external power supply to ICEJ3.

Table 4-11 presents all power models when supplying external power through Nu-Link2-Me. The Nu-Link2-Me external power sources are highlighted in yellow.

Model	Target Chip Voltage	ICEJ3	ICEJPR1 (MCUVCC) Selection [1]	ICEJPR2 (ICEVCC) Selection [2]	ICE Chip Voltage	SW2 Selection	J2	Vin	JP1
1	1.8 V	Connect to PC	1.8 V	1.8 V	1.8 V	Off	-	-	1.8 V output
2	3.3 V	Connect to PC	3.3 V (default)	3.3 V (default)	3.3 V	Off	-	-	3.3 V output
3	5 V	Connect to PC	5 V	3.3 V (default)	3.3 V	Off	-	-	5 V output
	Note: 1. 0 Ω should be soldered between ICEJPR1's MCUVCC and 1.8 V / 3.3 V / 5 V. 2. 0 Ω should be soldered between ICEJPR2's ICEVCC and 1.8 V / 3.3 V. 3. -: Unused.								

Table 4-11 Supply External Power through Nu-Link2-Me

4.4.8.2 *External Power Supply through M032KI Target Board to Target Chip*

The external power supply sources on M032KI target board are shown in Figure 4-6.

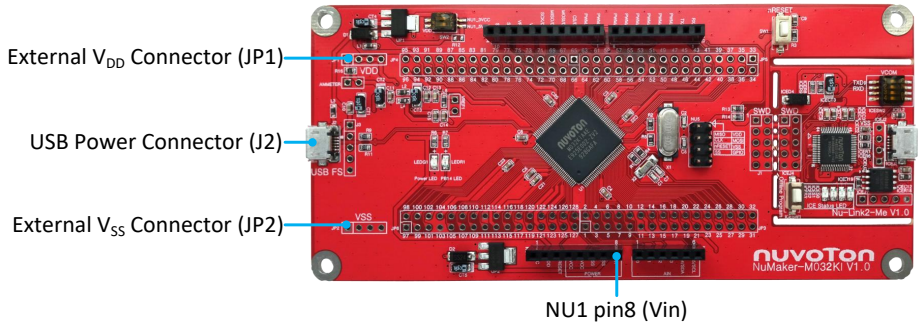


Figure 4-6 External Power Supply Sources on M032KI Target Board

To use Vin or J2 as external power supply source, please follow the steps below:

Switch the SW2 depending on the target chip operating voltage.

Remove the resistor on ICEJPR1 (MCUVCC).

Solder the resistor on ICEJPR2 (ICEVCC) depending on the ICE chip operating voltage.

Connect the external power supply to Vin or J2.

To use JP1 as external power supply source, please follow the steps below:

Switch the SW2 to OFF.

Remove the resistor on ICEJPR1 (MCUVCC).

Solder the resistor on ICEJPR2 (ICEVCC) depending on the ICE chip operating voltage.

Connect ICEJ3 to PC.

1. Connect the external power supply to JP1.
2.
3. To use Vin or J2 as external power supply source with Nu-Link2-Me detached from NuMaker-M032KI,
4. please follow the steps below:
5. Switch the SW2 depending on the target chip operating voltage.

Detach the Nu-Link2-Me from NuMaker-M032KI.

1. Connect the external power supply to Vin or J2.
2.
3. To use JP1 as external power supply source with Nu-Link2-Me detached from NuMaker-M032KI,
   please follow the steps below:

Switch the SW2 to OFF.

1. Detach the Nu-Link2-Me from NuMaker-M032KI.
2. Connect the external power supply to JP1.
3.

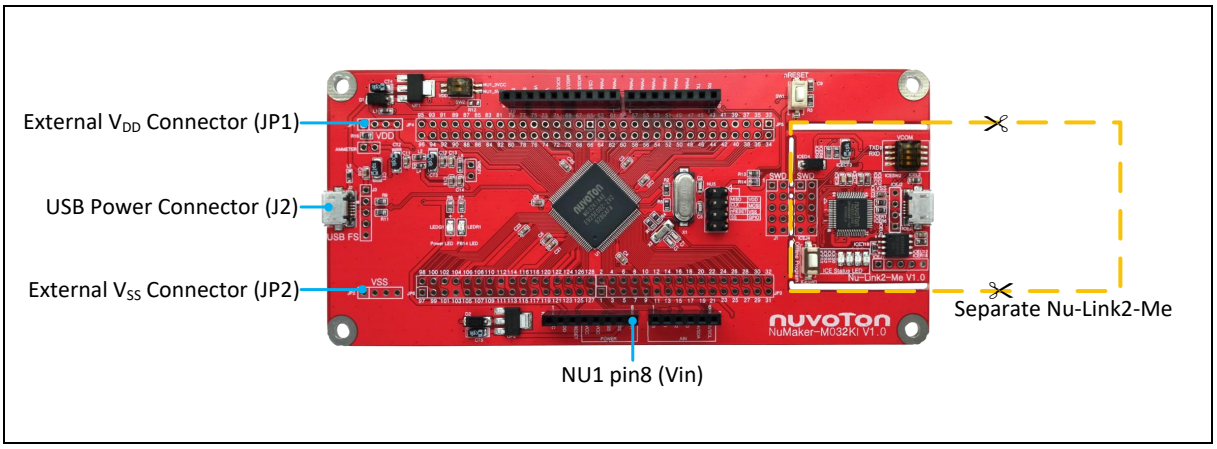


Figure 4-7 Detach the Nu-Link2-Me from NuMaker-M032KI

Table 4-12 presents all power models when supplies external power through M032KI target board. The M032KI target board external power sources are highlighted in yellow.

Model	Target Chip Voltage	Vin [1]	J2[1]	ICEJ3	SW2 Selection	JP1[2]	ICEJPR1 (MCUVCC) Selection [3]	ICEJPR2 (ICEVCC) Selection [4]	ICE Chip Voltage [5]
4	3.3 V	7 V ~ 12 V Input	-	-	NU1 3VCC	3.3 V output	Remove resistor	3.3 V	3.3 V
5	3.3 V	-	Connect to PC	-	NU1 3VCC	3.3 V output	Remove resistor	3.3 V	3.3 V
6	5 V	7 V ~ 12 V Input	-	-	NU1 5VCC	5 V output	Remove resistor	3.3 V	3.3 V
7	5 V	-	Connect to PC	-	NU1 5VCC	5 V output	Remove resistor	3.3 V	3.3 V
8	1.8 V ~ 3.6 V	-	-	Connect to PC	OFF	DC Input 1.8 V ~ 3.6 V	Remove resistor	1.8 V / 3.3 V	1.8 V / 3.3 V
9	1.8 V ~ 3.6 V	-	-	Nu-Link2-Me removed	OFF	DC Input 1.8 V ~ 3.6 V	-	-	-

Note:

1. The Vin input voltage will be converted by voltage regulator UP2 to 5 V. Supplying external power to Vin or J2 can provide 5 V to NU1 pin5 (5V) and 3.3 V to NU1 pin4 (3VCC).
2. JP1 external power input only provides voltage to target chip.
3. 0 Ω should be removed from ICEJPR1's MCUVCC and 1.8 V / 3.3 V / 5 V.
4. 0 Ω should be soldered between ICEJPR2's ICEVCC and 1.8 V / 3.3 V.
5. The ICE chip voltage should be close to the target chip voltage.
6. -: Unused

Table 4-12 Supply External Power for M032KI Target Board

4.5 External Reference Voltage Connector

Table 4-13 presents the external reference voltage connector.

Connector	Description
VREF1	Connector for user to connect to the external reference voltage pin of the target chip. User needs to remove the L5 ferrite bead.

Table 4-13 External Reference Voltage Connector

4.6 Ammeter Connector

Table 4-14 presents the ammeter connector.

Connector	Description
AMMETER	Connector for user to measure the target chip power consumption easily. User needs to remove the R16 resistor.

Table 4-14 Ammeter Connector

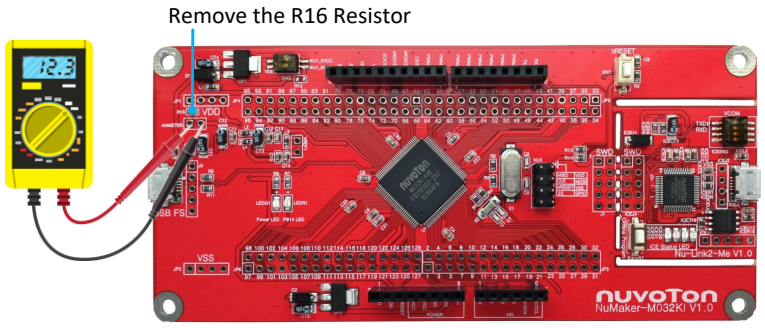


Figure 4-8 Wiring between Ammeter Connector and Ammeter

4.7 Push Buttons

Table 4-15 presents the push buttons.

Component	Description
ICESW1	Offline program button to start offline ICP programming the target chip.
SW1	Reset button to reset the target chip.

Table 4-15 Push Buttons

4.8 LEDs

Table 4-16 presents the LEDs.

Component	Description
Power LED	The power LED indicates that the NuMaker-M032KI is powered.
PB14 LED	The LED is connected to the target chip PB.14.
ICES0, ICES1, ICES2 and ICES3	Nu-Link2-Me status LED.

Table 4-16 LEDs

4.9 Nu-Link2-Me

The Nu-Link2-Me is an attached on-board debugger and programmer. The Nu-Link2-Me supports on-chip debugging, online and offline ICP programming through SWD interface. The Nu-Link2-Me also supports virtual COM port (VCOM) for printing debug messages on PC. Besides, the programming status could be shown on the built-in LEDs. Lastly, the Nu-Link2-Me could be detached from the evaluation board and become a stand-alone mass production programmer. For more information about Nu-Link2-Me, please refer to *Nu-Link2-Pro Debugger and Programmer User Manual*.

4.9.1 VCOM Switches

Table 4-17 presents how to set the VCOM function by ICESW2.

ICESW2		
Pin	**Function**	**Description**
1	TXD	**On**: Connect target chip PB.13 (UART0_TXD) to Nu-Link2-Me. **Off**: Disconnect target chip PB.13 (UART0_TXD) to Nu-Link2-Me.
2	RXD	**On**: Connect target chip PB.12 (UART0_RXD) to Nu-Link2-Me. **Off**: Disconnect target chip PB.12 (UART0_RXD) to Nu-Link2-Me.
Note: Pin 3 and 4 is unused.		

Table 4-17 VCOM Function of Nu-Link2-Me

Status LEDs

Table 4-18 presents the status LEDs patterns for different operation on Nu-Link2-Me.

Operation Status	Status LED			
	ICES0	ICES1	ICES2	ICES3
Boot	Flash x 3	Flash x 3	Flash x 3	Flash x 3
Idle	On	-	-	-
One Nu-Link2-Me is selected to connect	Flash x 3	Flash x 3	Flash x 3	On
ICE online (Not connected to a target chip)	On	-	Flash x 3	Flash x 3
ICE online (Connected to a target chip)	On	-	-	On
ICE online (Failed to connect to a target chip)	On	Any	Flash	On
During offline programming	-	On	-	Flash
Offline programming completed	On	-	-	-
Offline programming completed (Auto mode)	On	On	-	-
Offline programming failed	On	Flash	-	-
Note: “Online” means Nu-Link2-Me is connected to ICP Programming Tool, IDE or NuTool.				

Table 4-18 Operation Status LED Patterns

4.9.2

5 NUMAKER-M032KI QUICK START

5.1 Toolchains Supporting

Install the preferred toolchain. Please make sure at least one of the toolchains has been installed.

- KEIL MDK Nuvoton edition M0/M23
- IAR EWARM
- NuEclipse GCC (for Windows)
- NuEclipse GCC (for Linux)

5.2 Nuvoton Nu-Link Driver Installation

Download and install the latest Nuvoton Nu-Link Driver.

- Download and install Nu-Link_Keil_Driver when using Keil MDK.
- Download and install Nu-Link_IAR_Driver when using IAR EWARM.
- Skip this step when using NuEclipse.

Please install the Nu-Link USB Driver as well at the end of the installation. The installation is presented in Figure 5-1 and Figure 5-2.

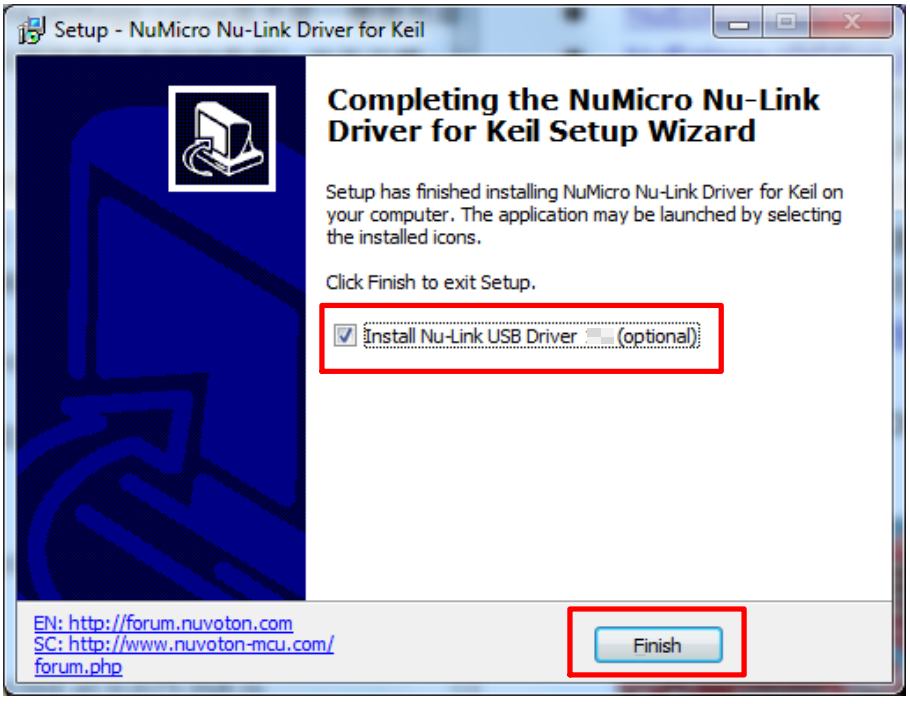


Figure 5-1 Nu-Link USB Driver Installation Setup

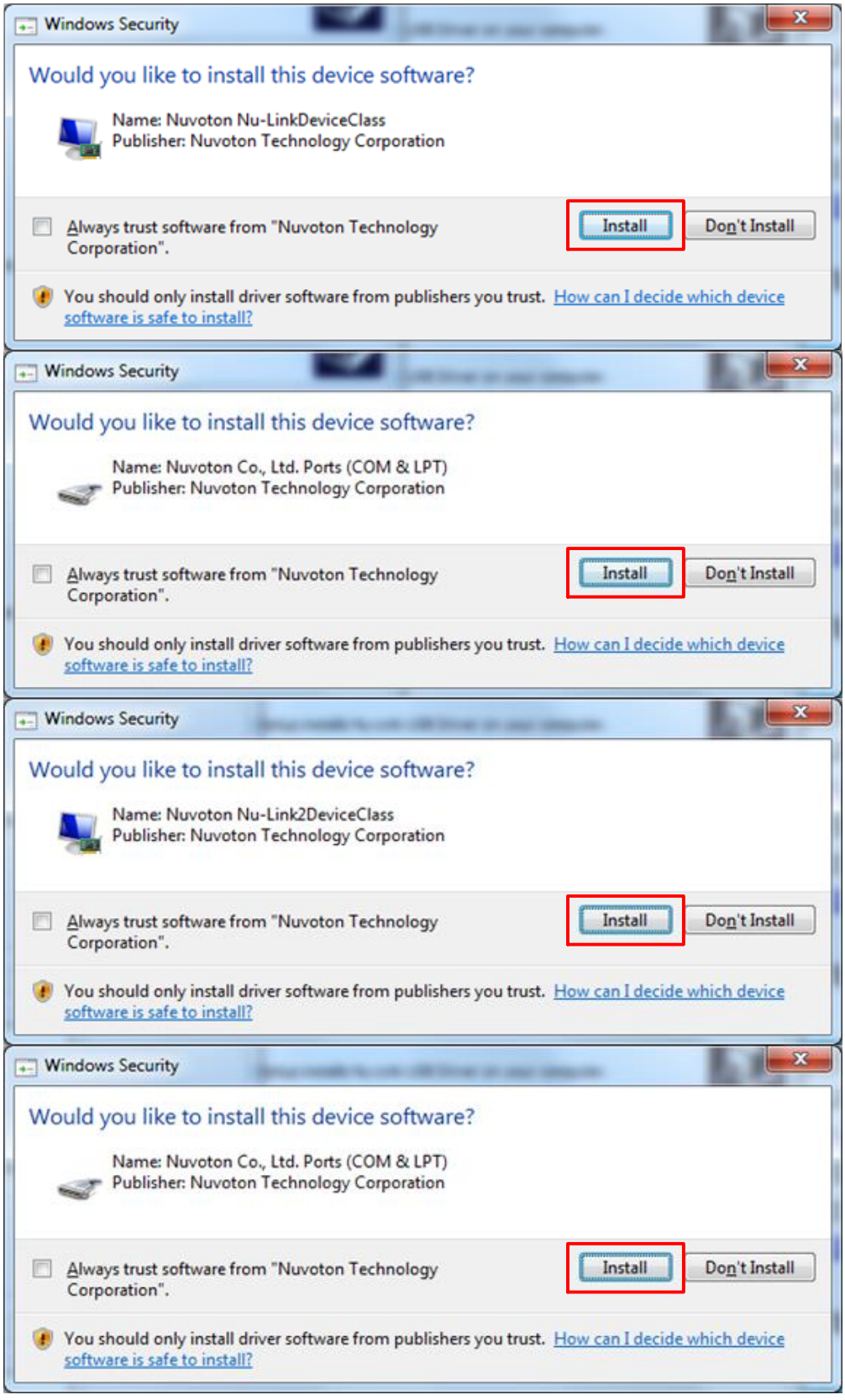


Figure 5-2 Nu-Link USB Driver Installation

5.3 BSP Firmware Download

Download and unzip the Board Support Package (BSP).

5.4 Hardware Setup

Open the virtual COM (VCOM) function by changing Nu-Link2-Me VCOM Switch No. 1 and 2 to ON.

1.

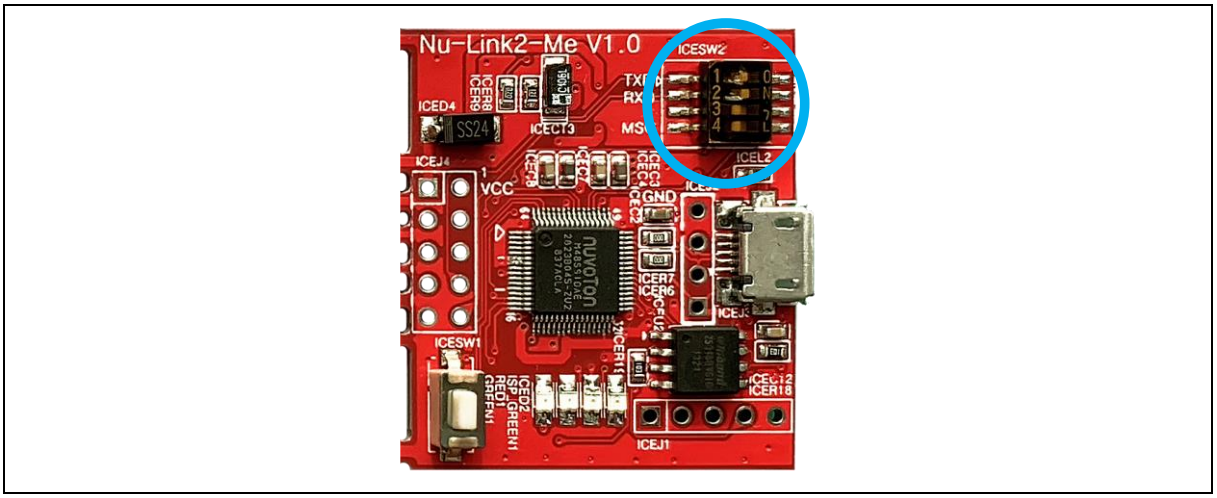


Figure 5-3 Open VCOM Function

2. Connect the ICE USB connector shown in Figure 5-4 to the PC USB port through a USB cable.

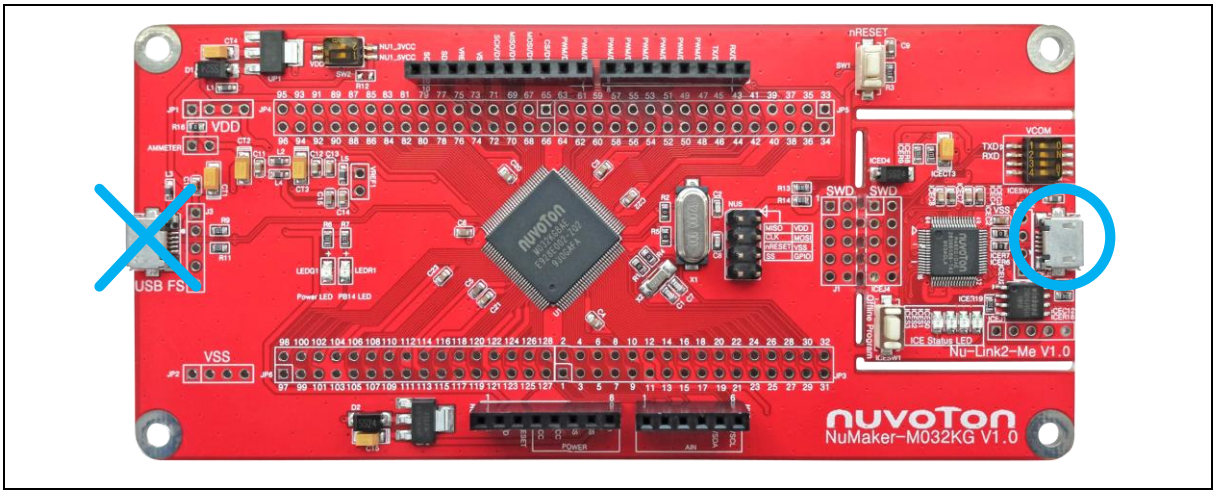


Figure 5-4 ICE USB Connector

Find the “Nuvoton Virtual COM Port” on the Device Manger as Figure 5-5.

3.

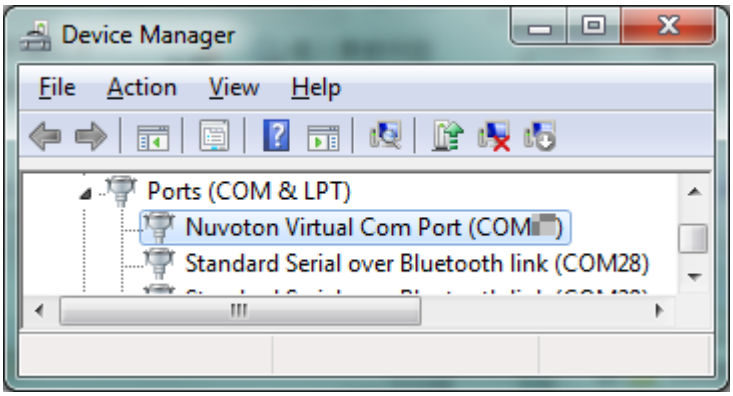


Figure 5-5 Device Manger

Open a serial port terminal, PuTTY for example, to print out debug message. Set the speed to 115200. Figure 5-6 presents the PuTTY session setting.

4.

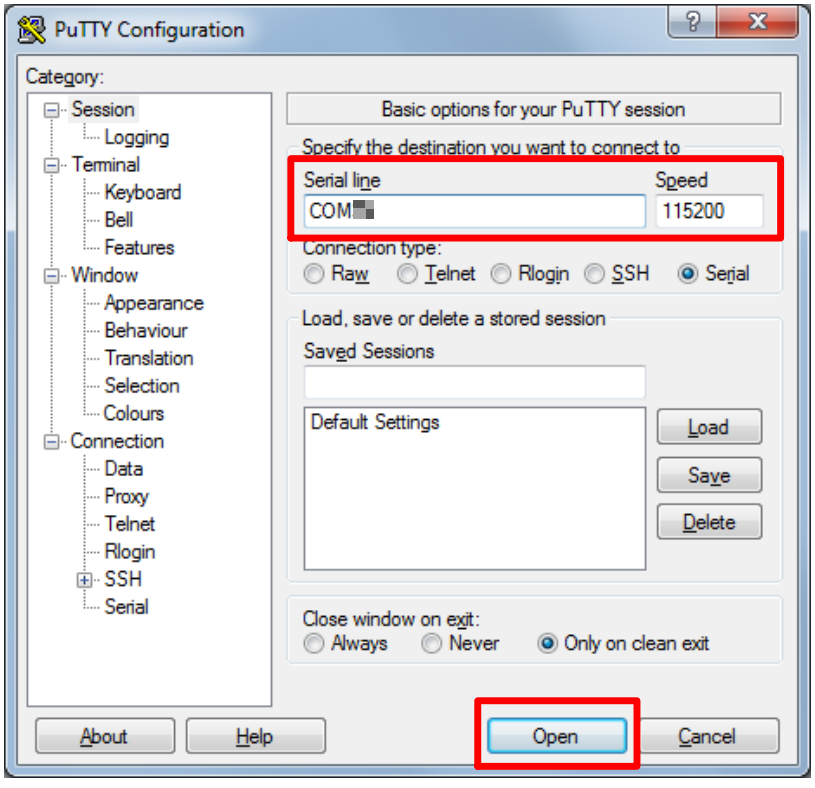


Figure 5-6 PuTTY Session Setting

5.5 Find the Example Project

Use the “Template” project as an example. The project can be found under the BSP folder as shown in Figure 5-7.

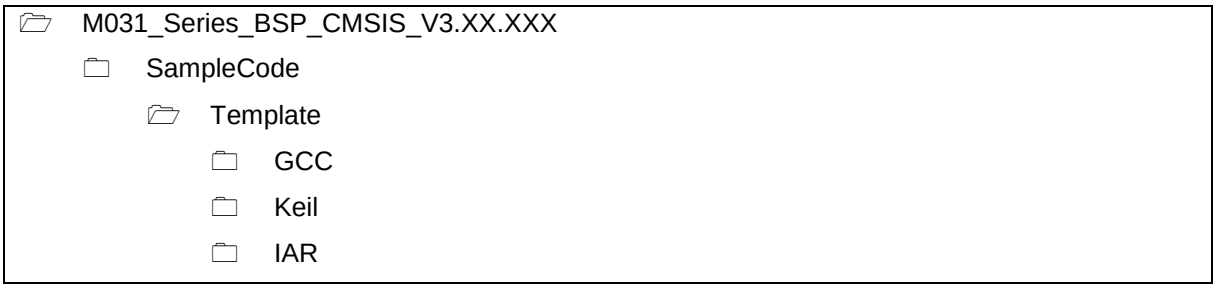


Figure 5-7 Template Project Folder Path

5.6 Execute the Project under Toolchains

Open and execute the project under the toolchain. The section 5.6.1, 5.6.2, and 5.6.3 describe the steps of executing project in Keil MDK, IAR EWARM and NuEclipse, respectively.

5.6.1 Keil MDK

This section provides steps to beginners on how to run a project by using Keil MDK.

1. Double-click the “Template.uvproj” to open the project.

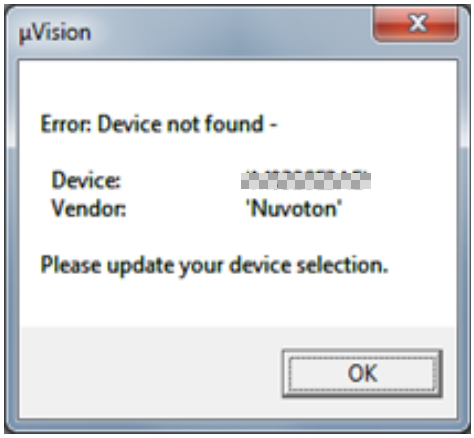


Figure 5-8 Warning Message of “Device not found”

Note: If Figure 5-8 warning message jumps out, please migrate to version 5 format as shown in Figure 5-9. The “.uvproj” filename extension will change to “.uvprojx”.

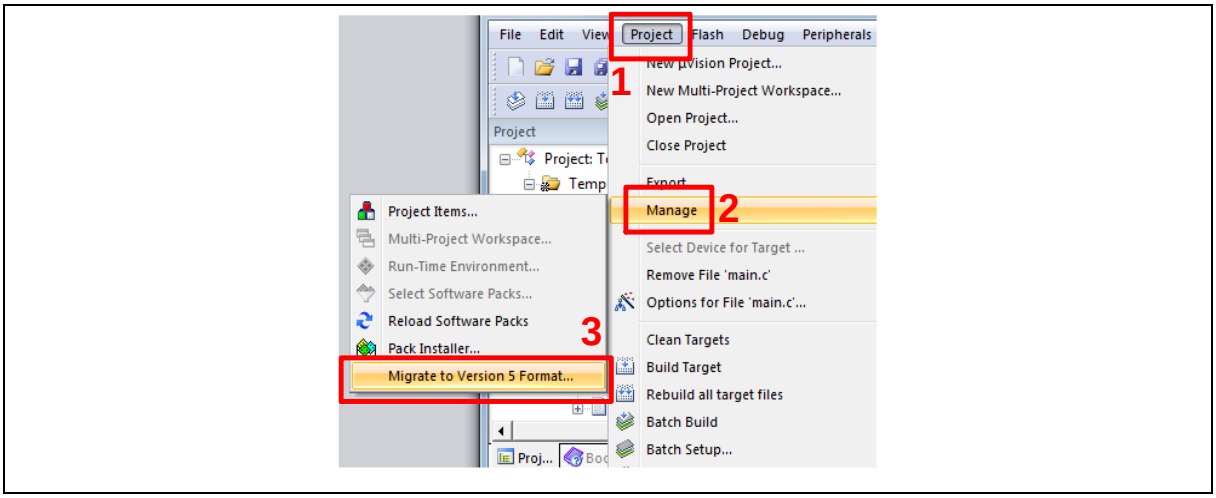


Figure 5-9 Project File Migrate to Version 5 Format

2. Make sure the debugger is “Nuvoton Nu-Link Debugger” as shown in Figure 5-10 and Figure 5-11.

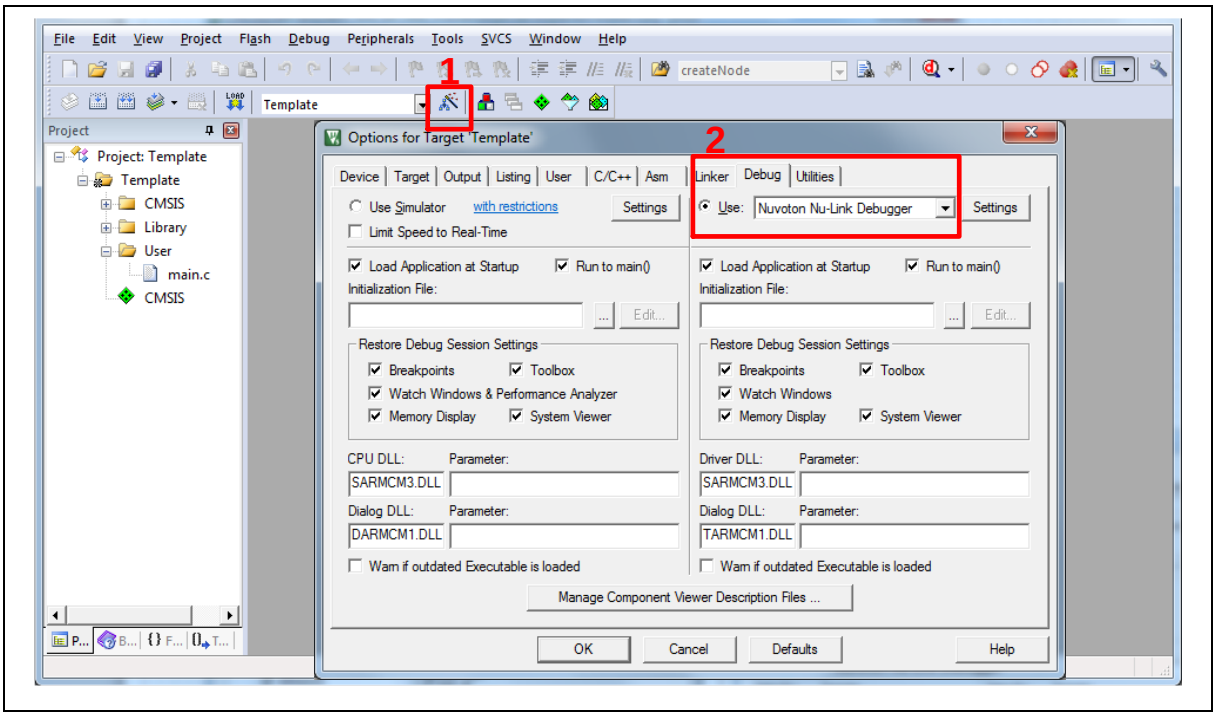


Figure 5-10 Debugger Setting in Options Window

Note: If the dropdown menu in Figure 5-10 does not contain “Nuvoton Nu-Link Debugger” item, please rework section 5.2.

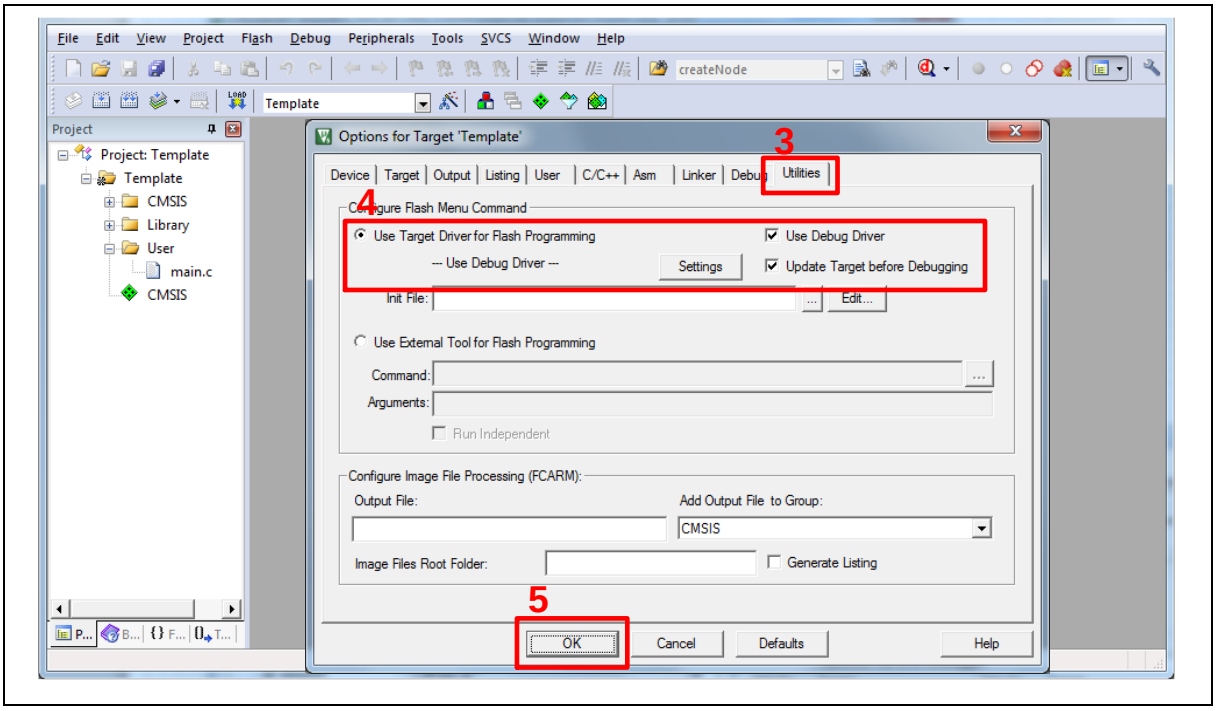


Figure 5-11 Programming Setting in Options Window

3. Rebuild all target files. After successfully compiling the project, download code to the Flash memory. Click "**Start/Stop Debug Section**" button to enter debug mode.

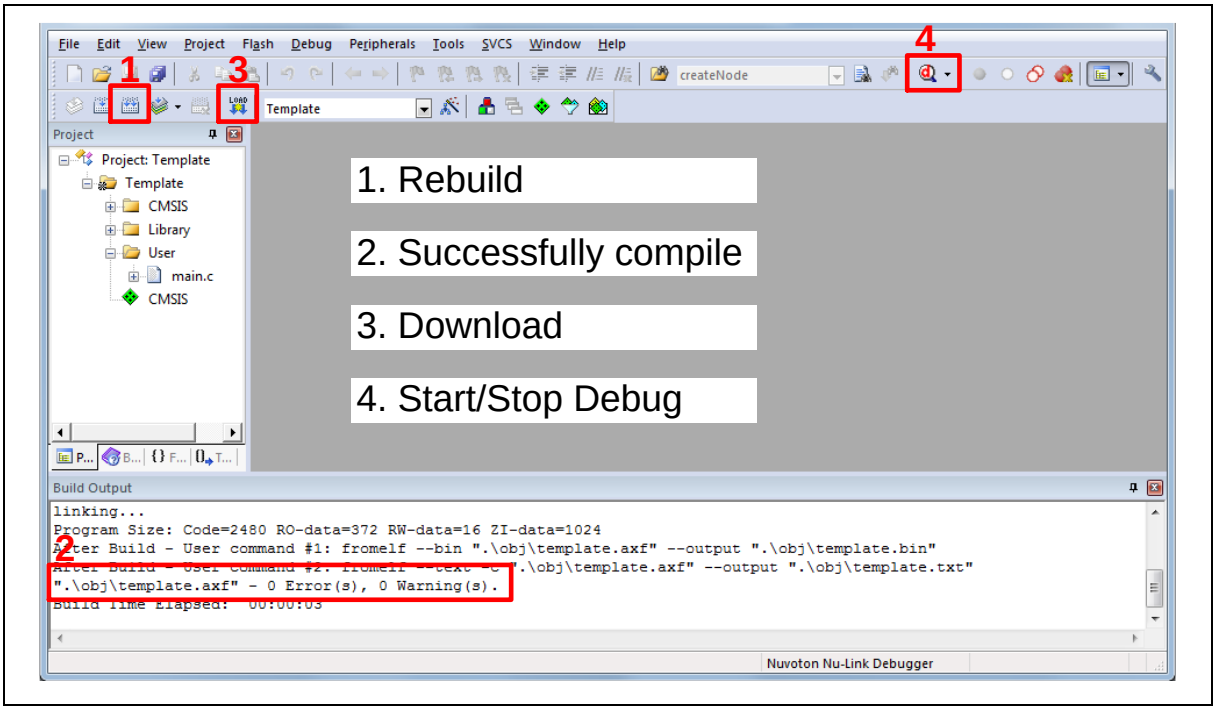


Figure 5-12 Compile and Download the Project

Figure 5-13 shows the debug mode under Keil MDK. Click “**Run**” and the debug message will be printed out as shown in Figure 5-14. User can debug the project under debug mode by checking source code, assembly language, peripherals’ registers, and setting breakpoint, step run, value monitor, etc.

4.

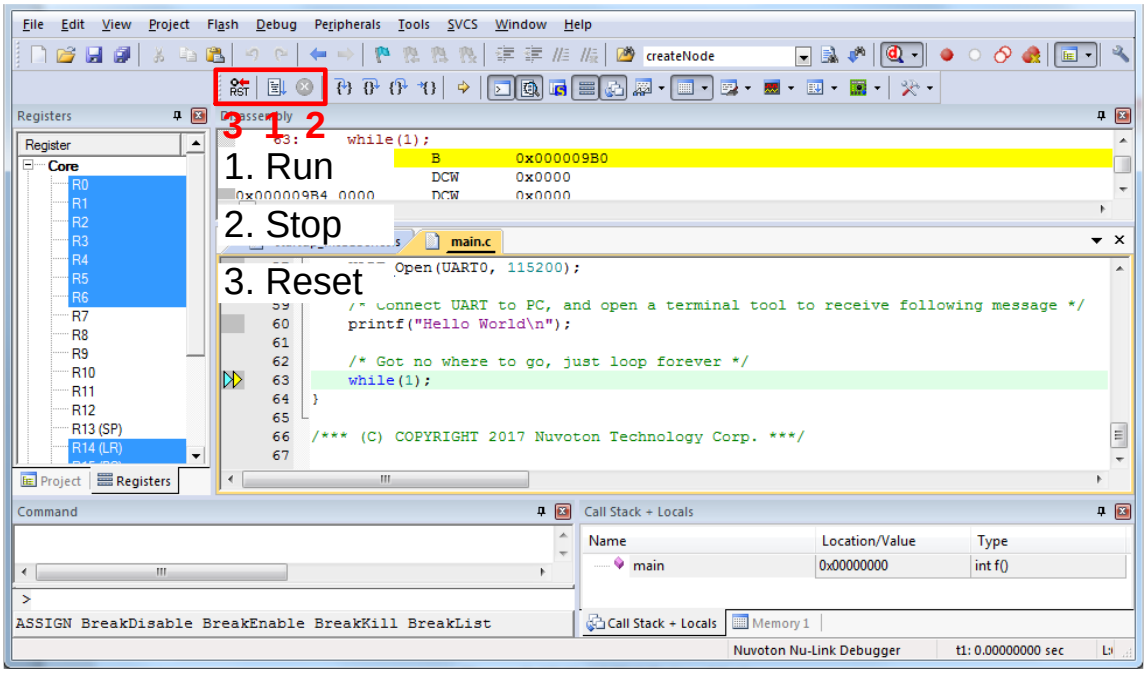


Figure 5-13 Keil MDK Debug Mode

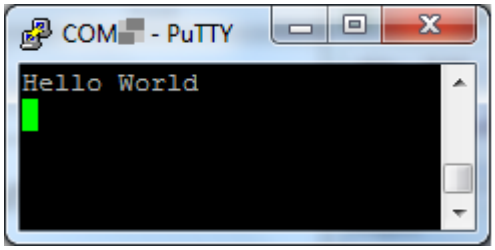


Figure 5-14 Debug Message on Serial Port Terminal Windows

IAR EWARM

This section provides steps to beginners on how to run a project by using IAR EWARM.

Double click the “Template.eww” to open the project.

Make sure the toolbar contains “Nu-Link” item as shown in Figure 5-15.

5.6.2 **Note:** If the toolbar does not contain “Nu-Link” item, please rework section 5.2.

1.
2.

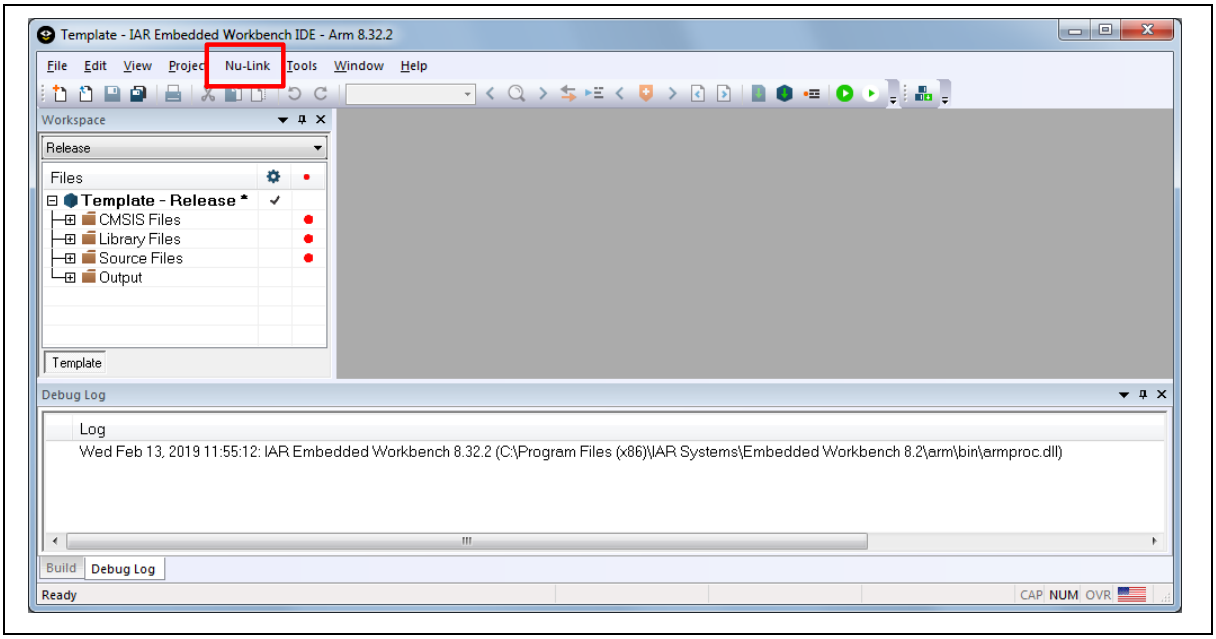


Figure 5-15 IAR EWARM Window

3.

Make a target file as presented in Figure 5-16. After successfully compiling the project, download code to the Flash memory and enter debug mode.

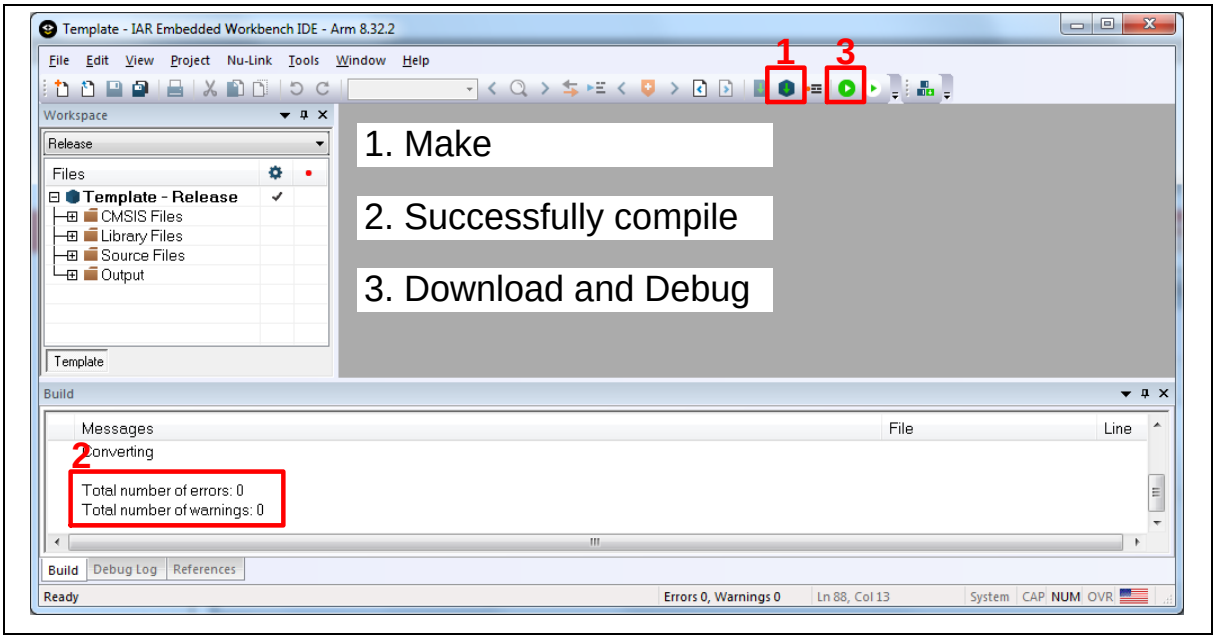


Figure 5-16 Compile and Download the Project

Figure 5-17 shows the debug mode under IAR EWARN. Click "**Go**" and the debug message will be printed out as shown in Figure 5-18. User can debug the project under debug mode by checking source code, assembly language, peripherals' registers, and setting breakpoint, step run, value monitor, etc.

4.

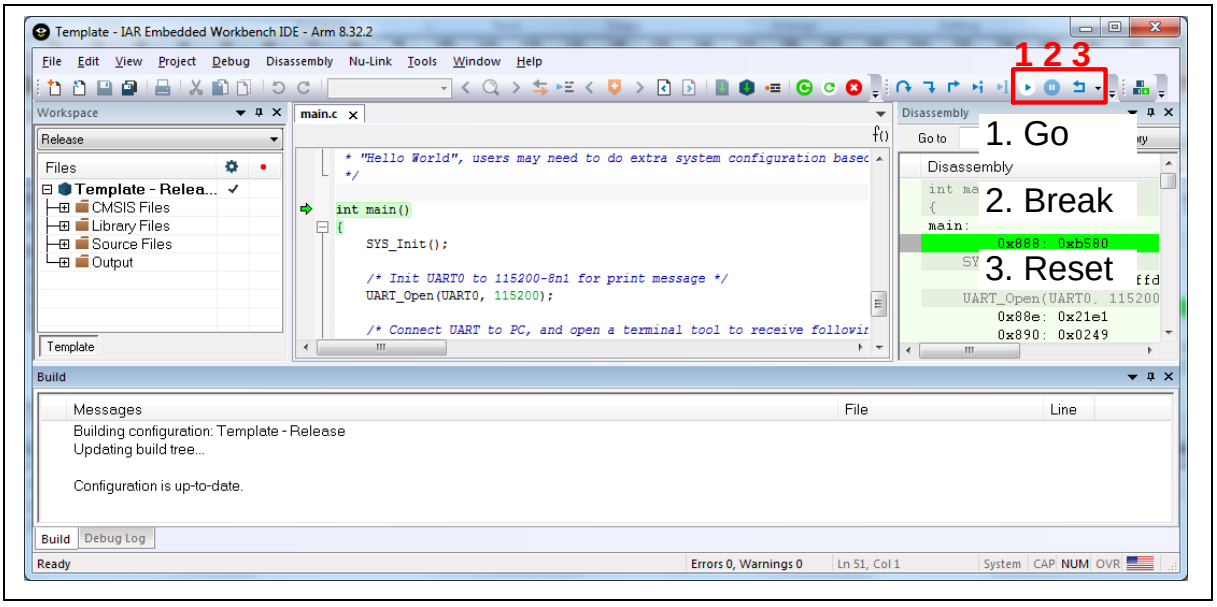


Figure 5-17 IAR EWARM Debug Mode

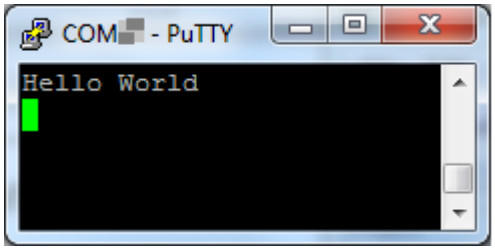


Figure 5-18 Debug Message on Serial Port Terminal Windows

NuEclipse

This section provides steps to beginners on how to run a project by using NuEclipse. Please make sure the filenames and project folder path contain neither invalid character nor space.

Double-click “NuEclipse.exe" to open the toolchain.

5.6.3 Import the “Template” project by following the steps presented in Figure 5-19 and Figure 5-20.

1.
2.

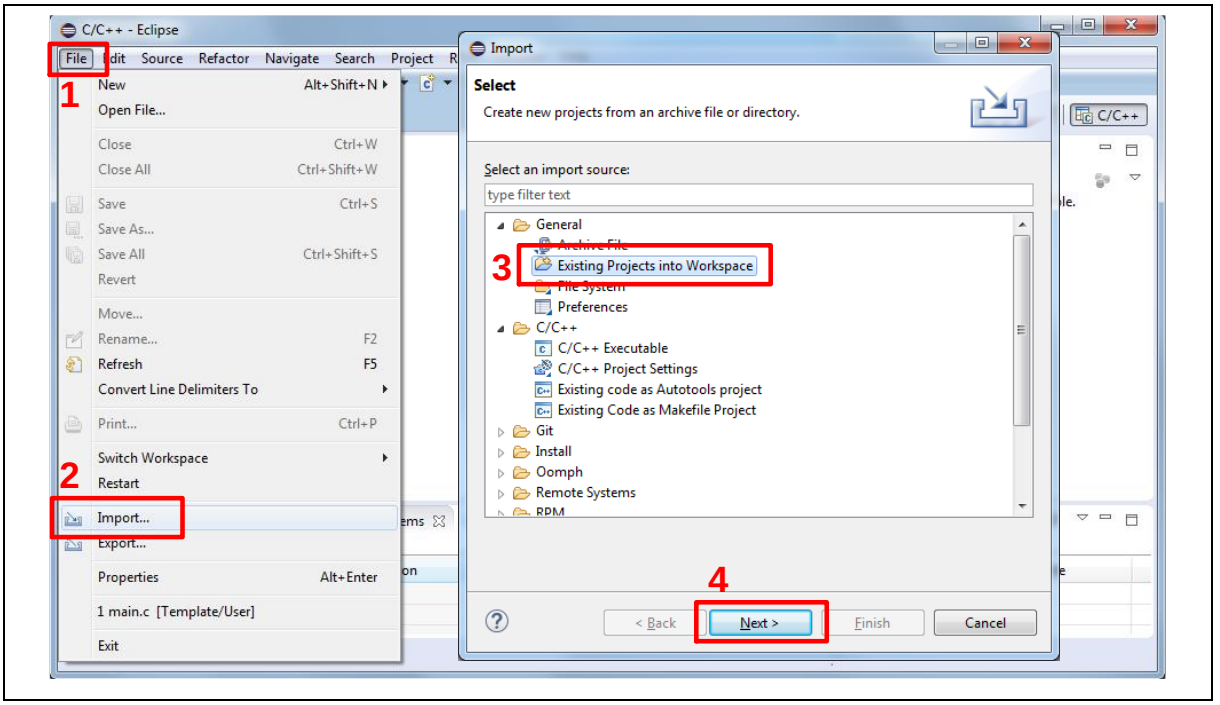


Figure 5-19 Import the Project in NuEclipse

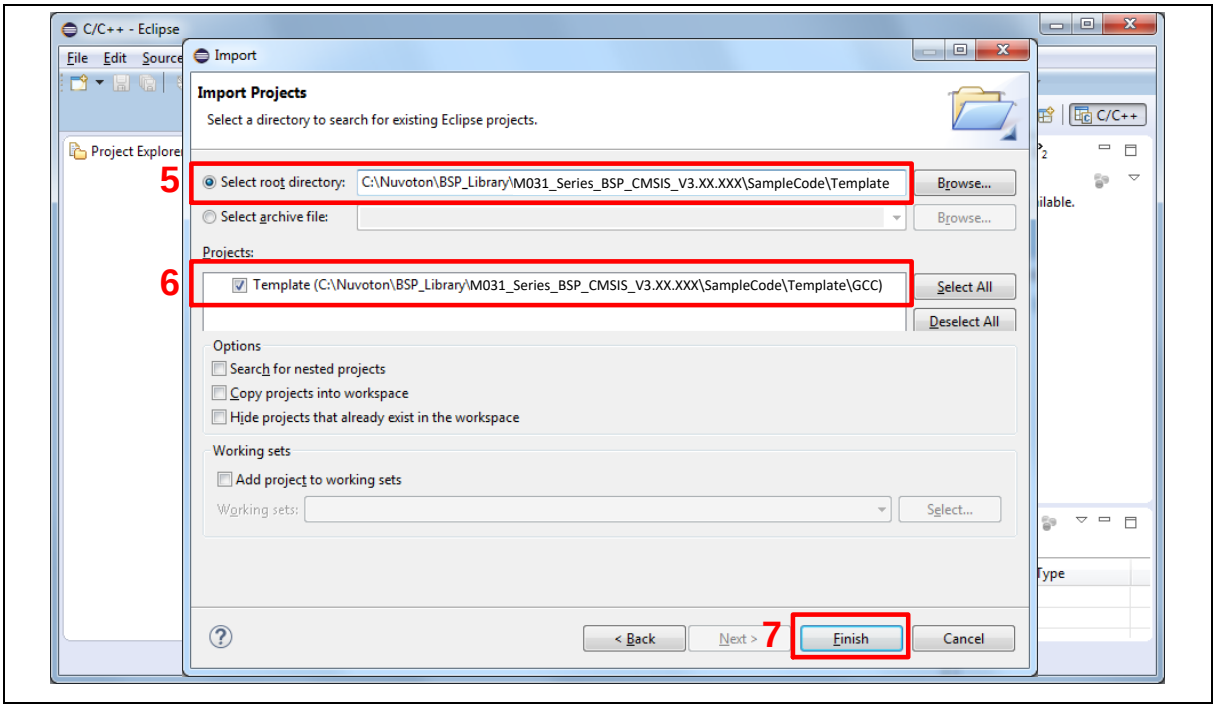


Figure 5-20 Import Projects Windows

3. Click the “Template” project and find the project properties as shown in Figure 5-21. Make sure the settings are the same as settings in Figure 5-22.

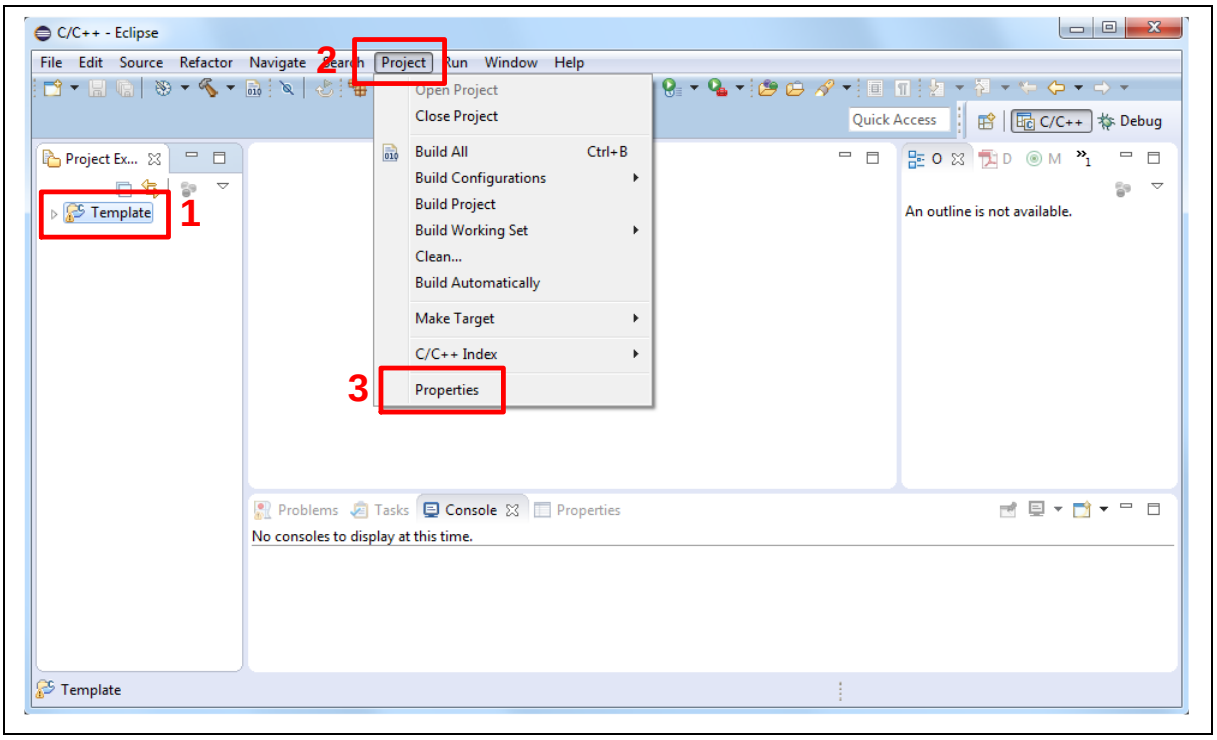


Figure 5-21 Open Project Properties Window

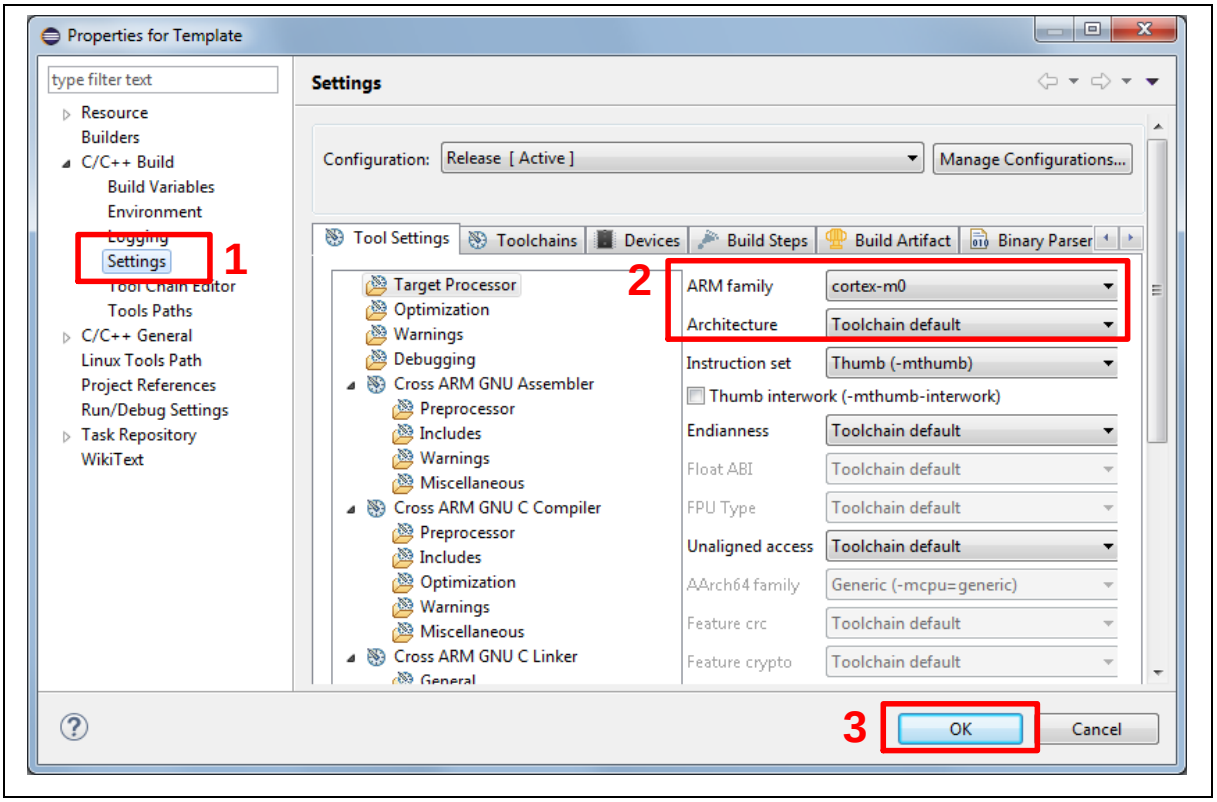


Figure 5-22 Project Properties Settings

Click the “Template” project and build the project.

4.

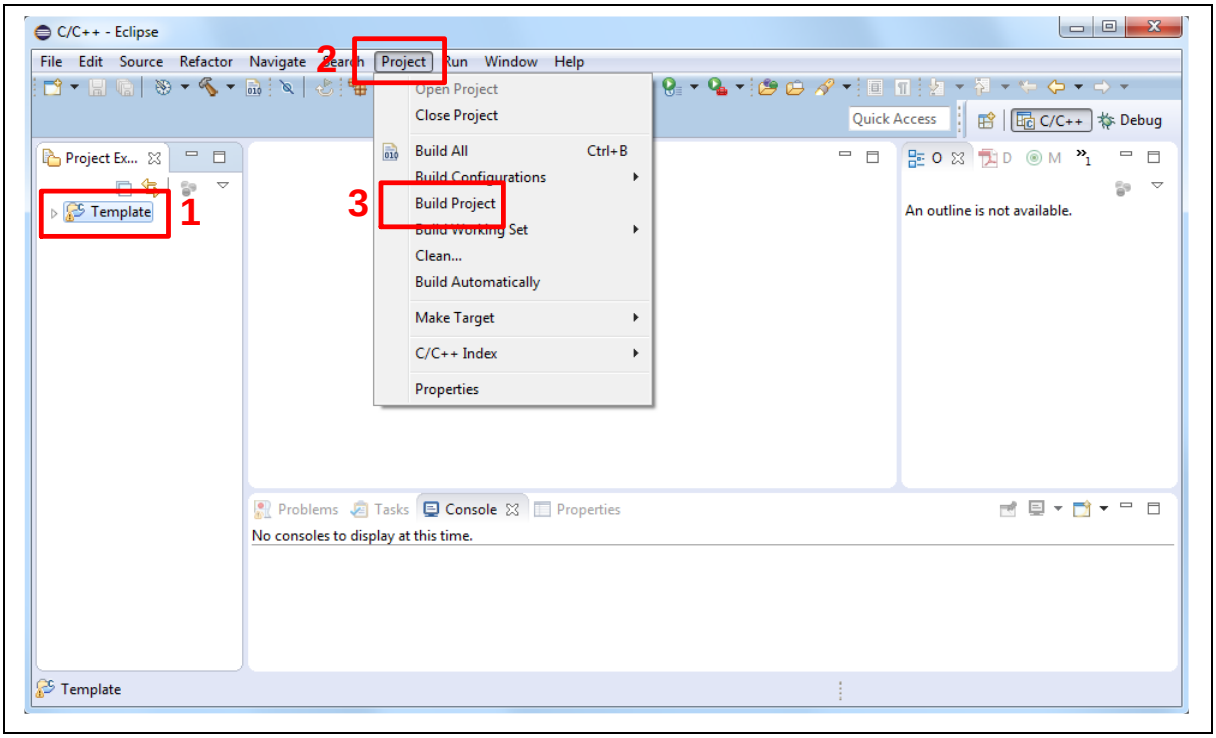


Figure 5-23 Build Project

5. After the project is built, click the “Template” project and set the “Debug Configuration” as shown in Figure 5-24. Follow the settings presented in Figure 5-25, Figure 5-26 and Figure 5-27 to enter debug mode.

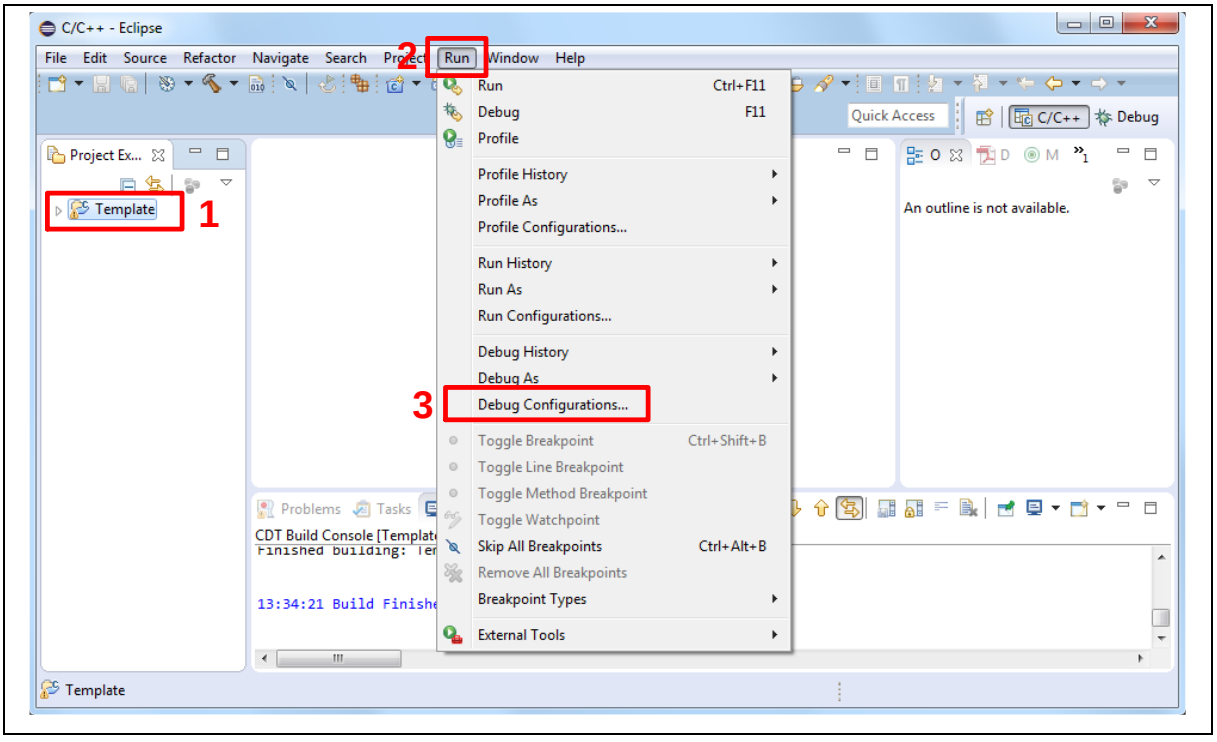
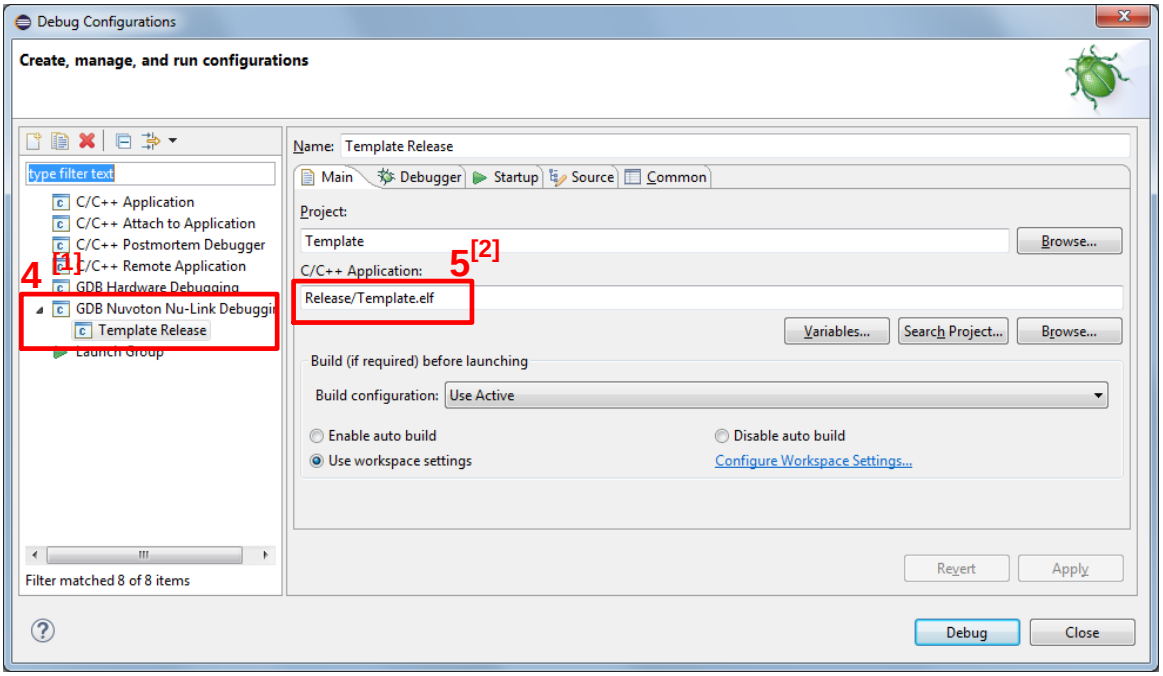


Figure 5-24 Open Debug Configuration



Note 1: Double-click the “GDB Nuvoton Nu-Link Debugging” to create the sub item.

Note 2: After the project is built, the “*.elf” file will be shown in “C/C++ Application” frame.

Figure 5-25 Main Tab Configuration

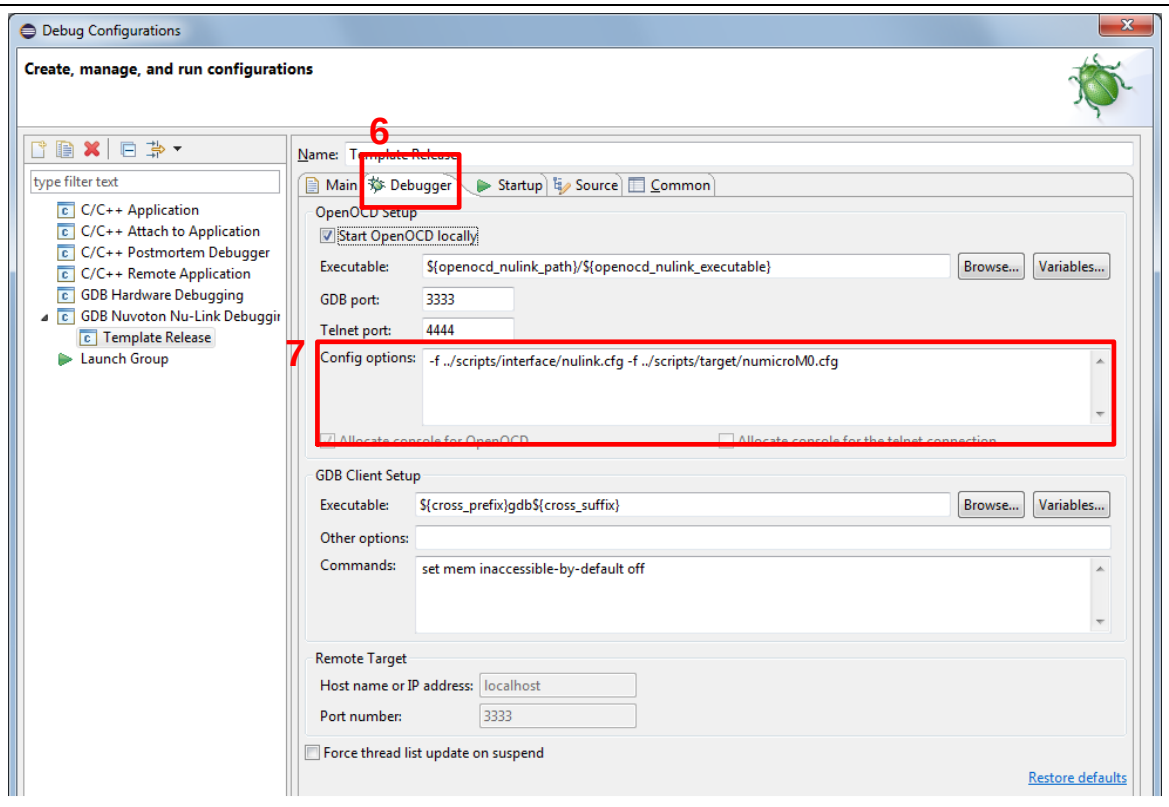
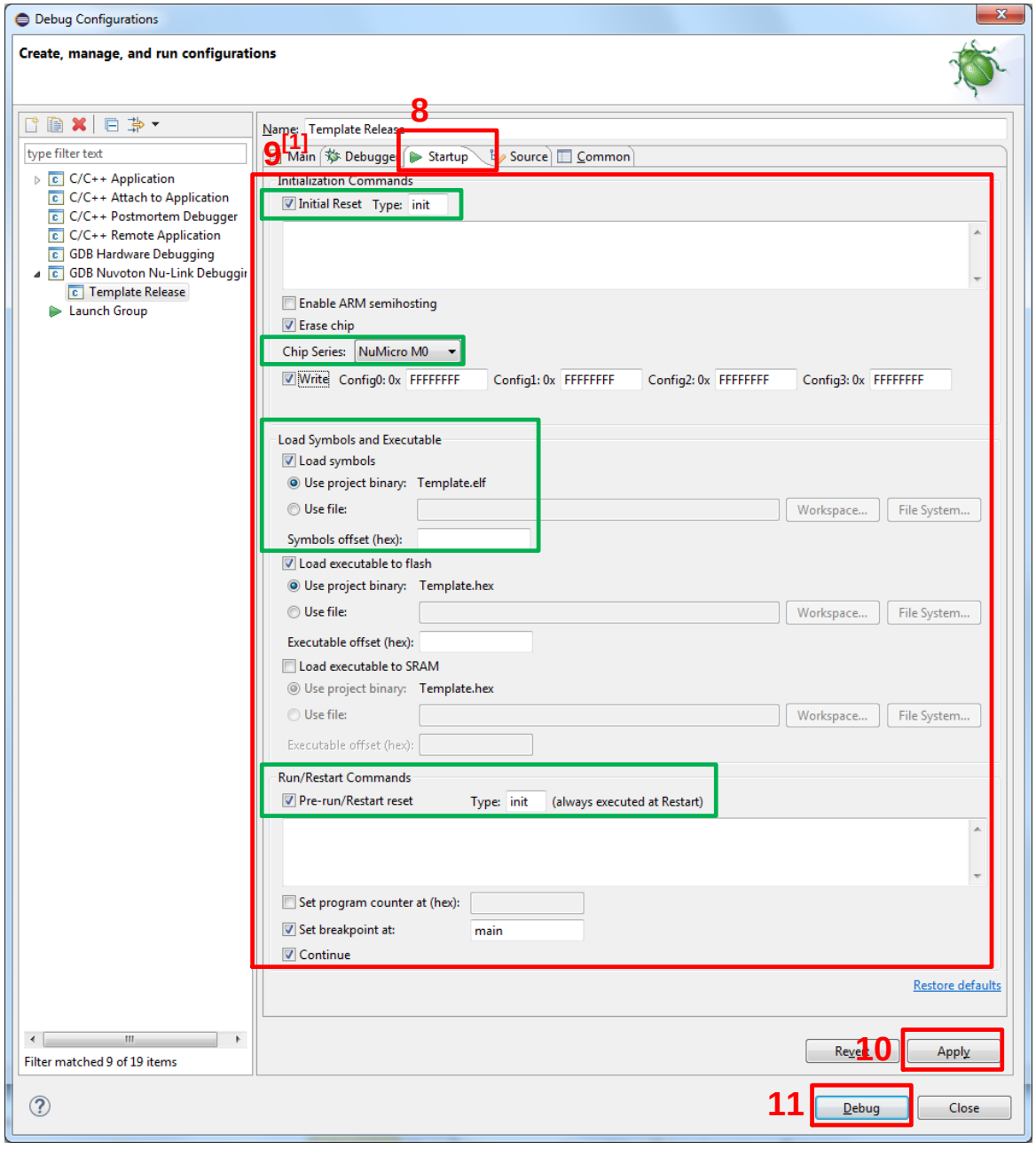


Figure 5-26 Debugger Tab Configuration



Note: User must follow those settings highlighted in green, and configure other settings depending on the needs.

Figure 5-27 Startup Tab Configuration

Figure 5-28 shows the debug mode under NuEclipse. Click "**Resume**" and the debug message will be printed out as shown in Figure 5-29. User can debug the project under debug mode by checking source code, assembly language, peripherals' registers, and setting breakpoint, step run, value monitor, etc. For more information about how to use NuEclipse, please refer to the *NuEclipse User Manual*.

6.

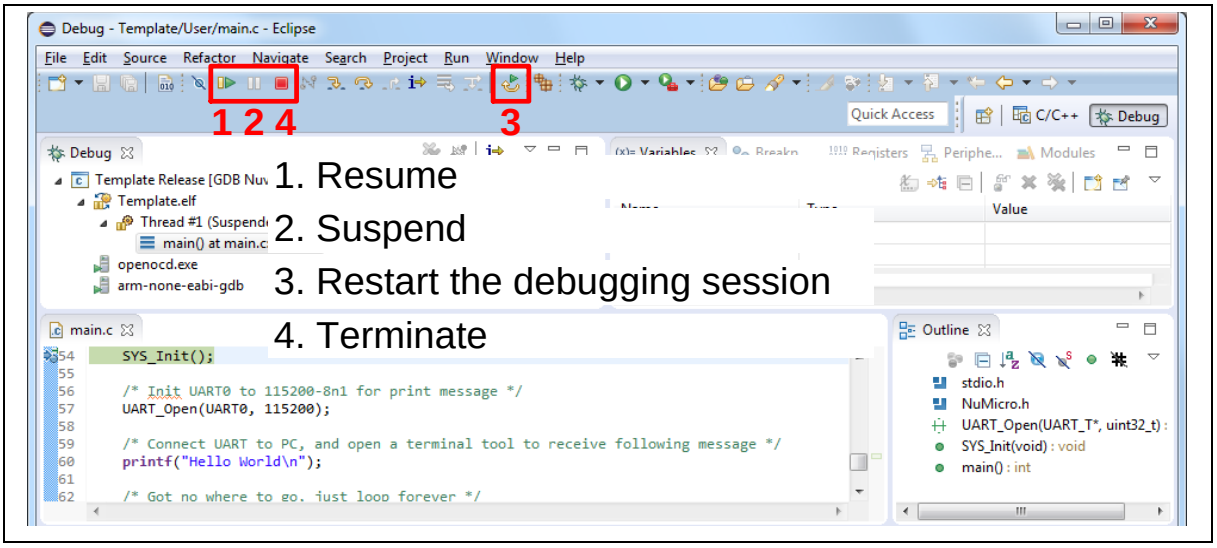


Figure 5-28 NuEclipse Debug Mode

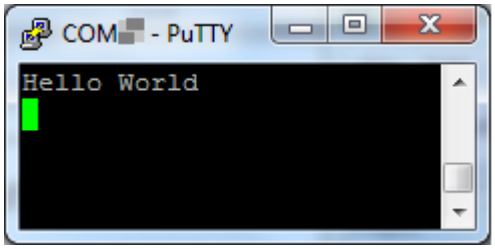


Figure 5-29 Debug Message on Serial Port Terminal Windows

6 EMWIN GUI LIBRARY PACKAGE QUICK START

6.1 emWin GUI Library Package Download

Download and unzip the emWin GUI Library Package to Board Support Package (BSP).

6.2 Find the M032 emWin Quick Start Guide

The "*M032 emWin Quick Start Guide.pdf*" can be found under the emWin GUI library package folder as shown in Figure 6-1.

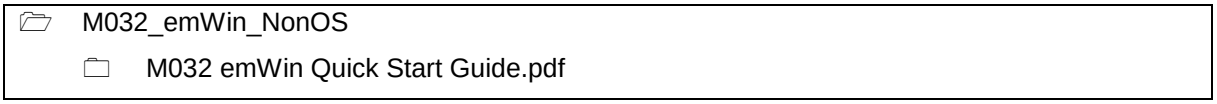


Figure 6-1 M032 emWin Quick Start Guide Folder Path

7 NUTFT KIT BOARD SCHEMATICS

7.1 NuTFT Kit Board

Figure 7-1 shows the NuTFT Kit Board circuit.

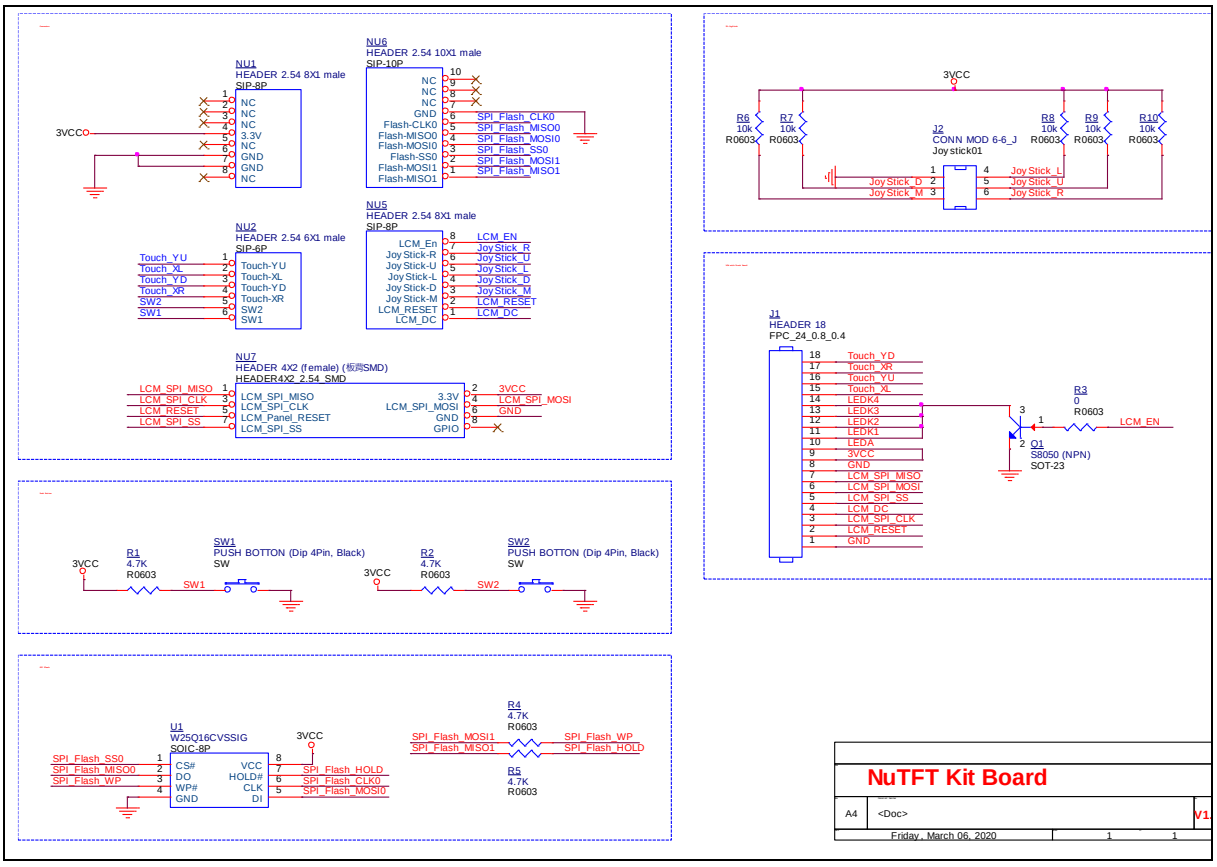


Figure 7-1 NuTFT Kit Board Circuit

7.2 PCB Placement

Figure 7-2 and Figure 7-3 show the front and rear placement of NuTFT Kit Board.

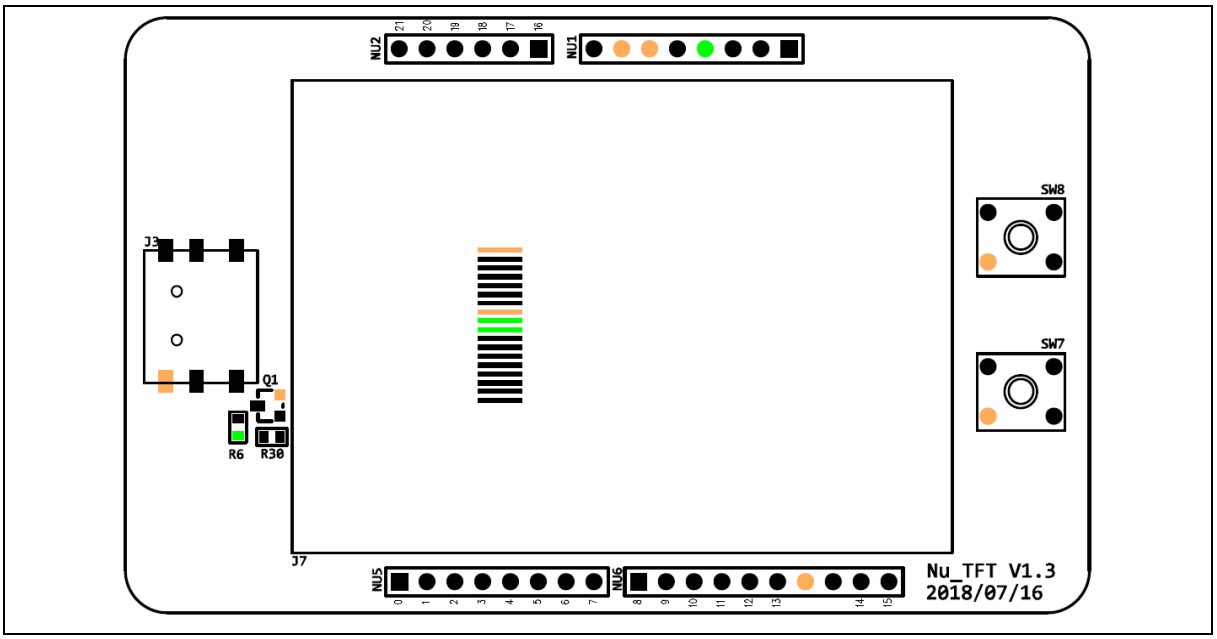


Figure 7-2 Front Placement

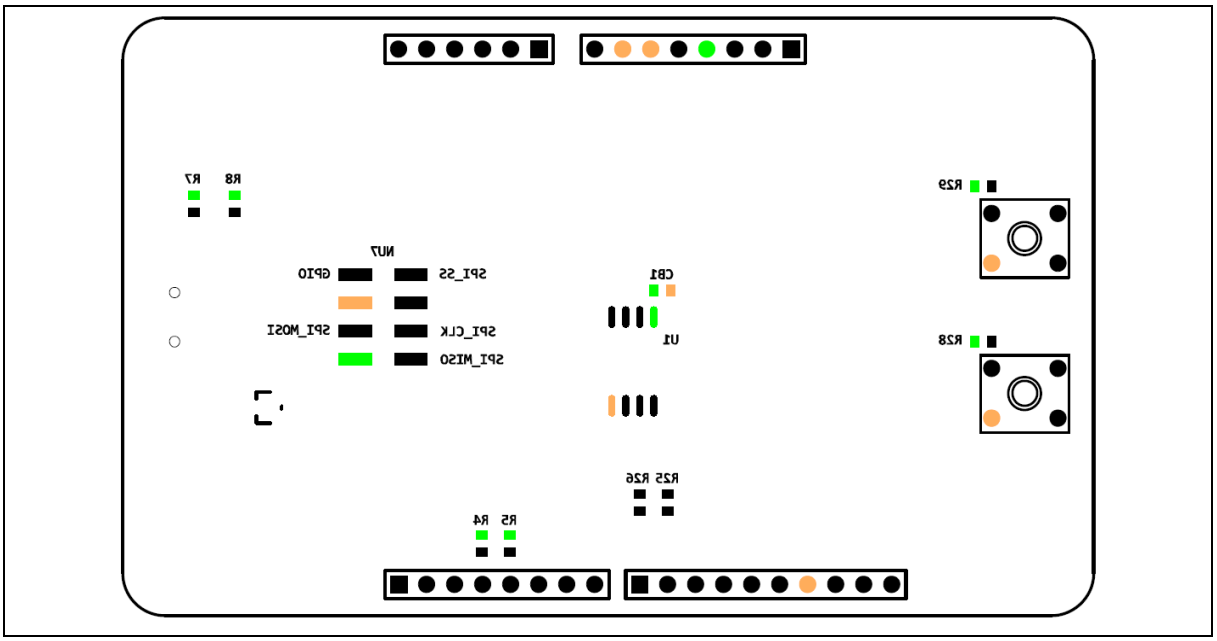


Figure 7-3 Rear Placement

8 NUMAKER-M032KI SCHEMATICS

8.1 Nu-Link2-Me

Figure 8-1 shows the Nu-Link2-Me circuit.

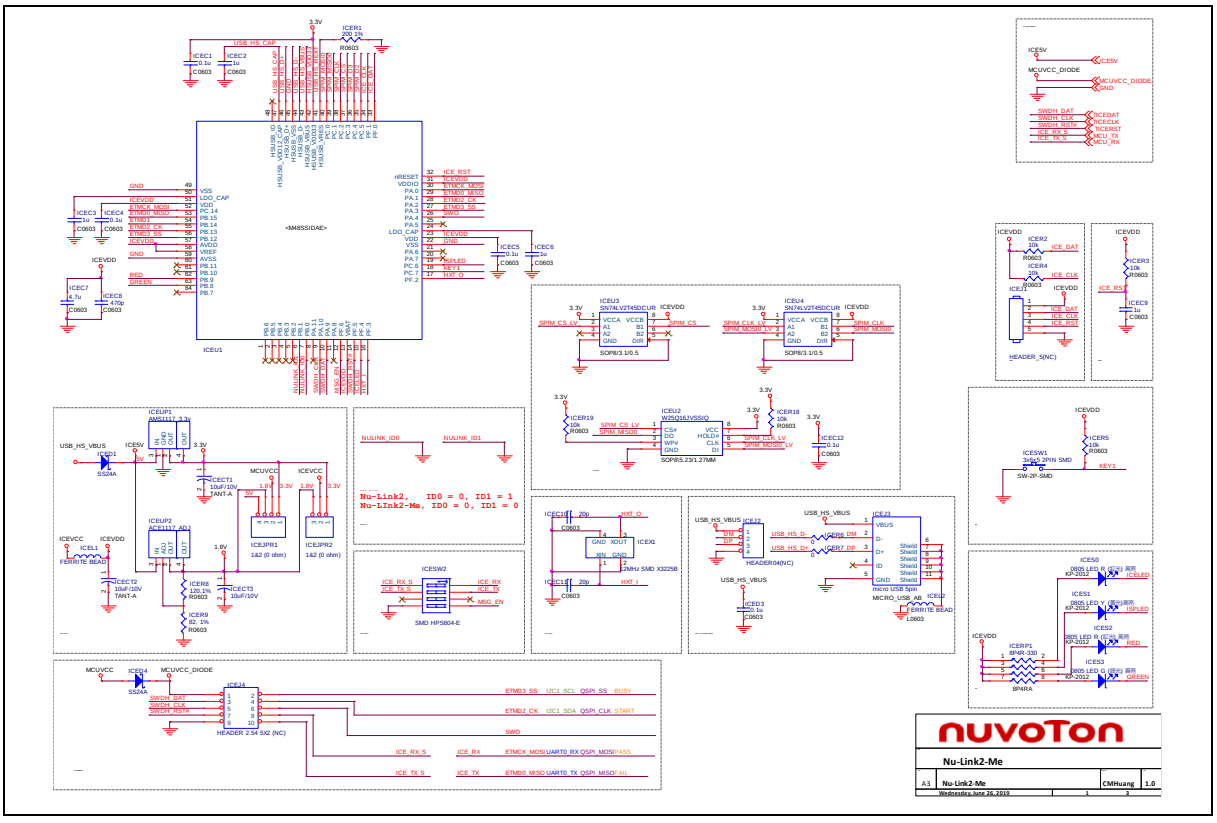


Figure 8-1 Nu-Link2-Me Circuit

8.2 M032KI Target Board

Figure 8-2 shows the M032KI target board circuit.

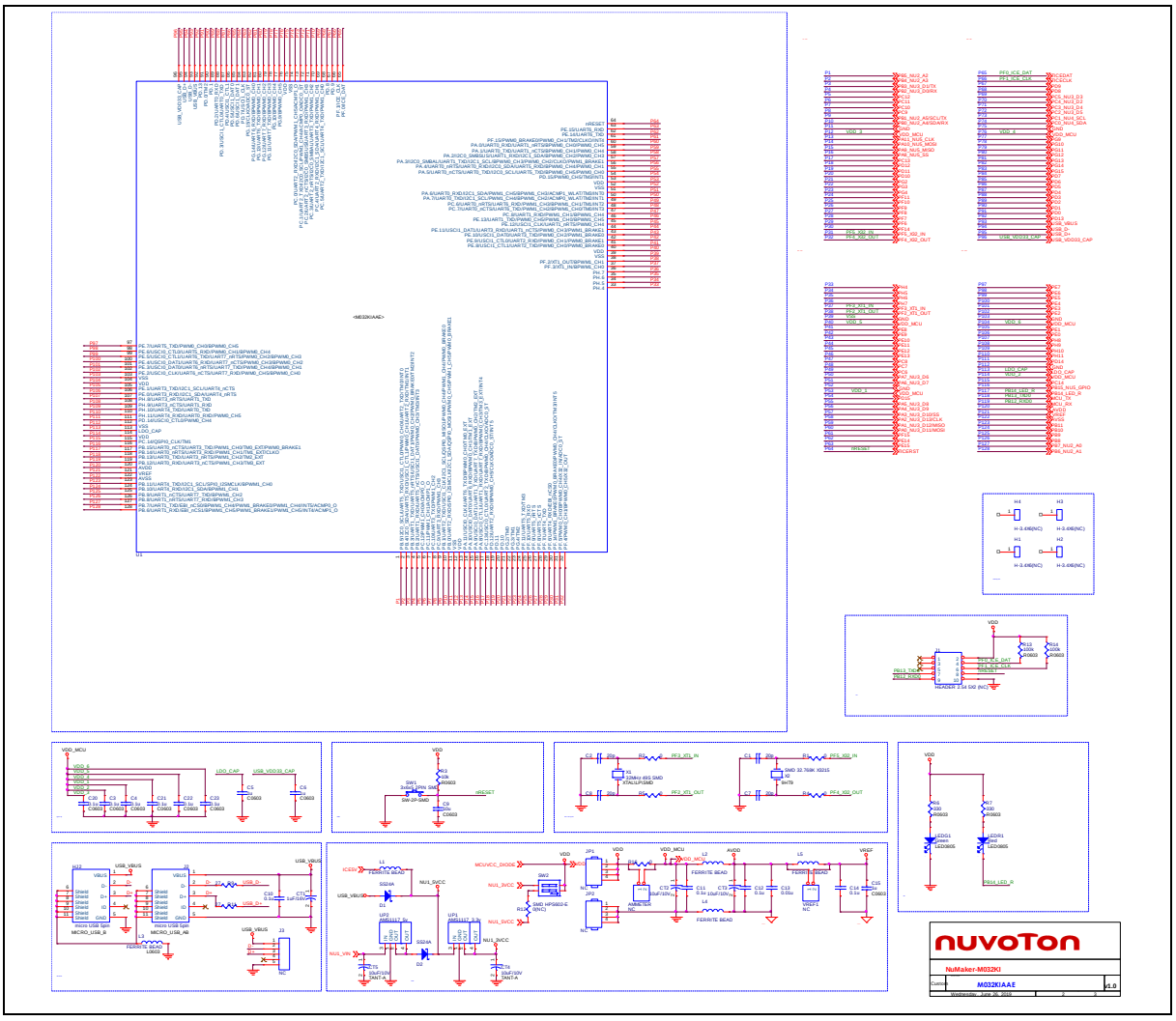


Figure 8-2 M032KI Target Board Circuit

8.3 Extension Connectors

Figure 8-3 shows extension connectors of NuMaker-M032KI.

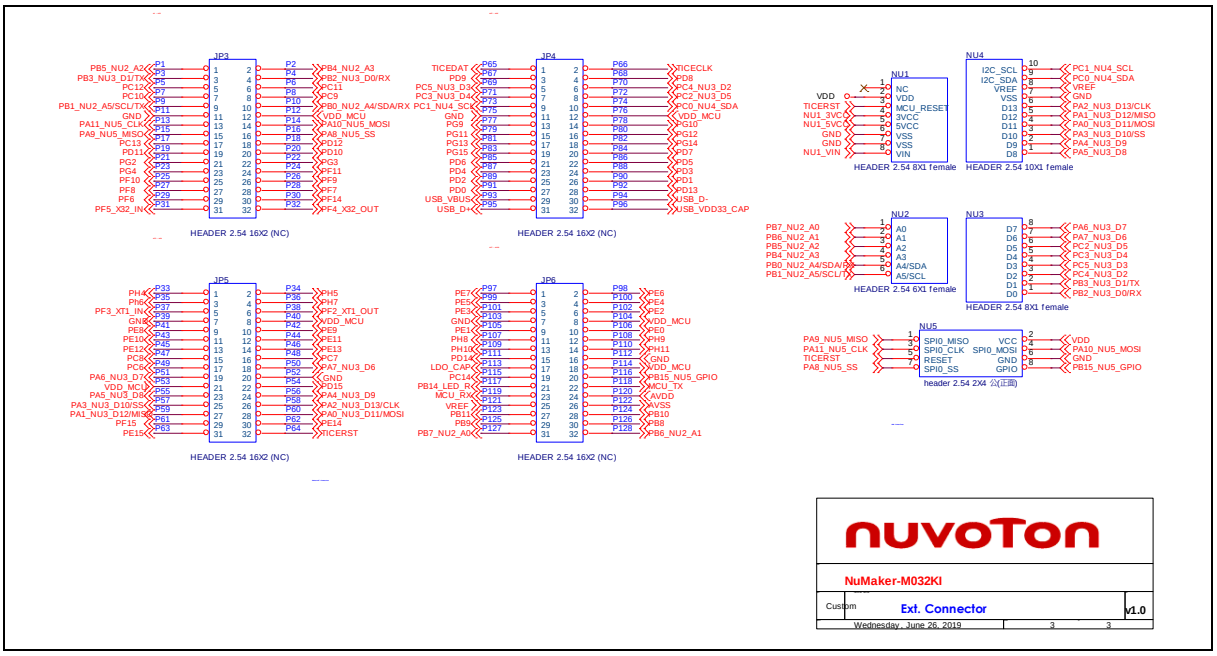


Figure 8-3 Extension Connectors Circuit

8.4 PCB Placement

Figure 8-4 and Figure 8-5 show the front and rear placement of NuMaker-M032KI.

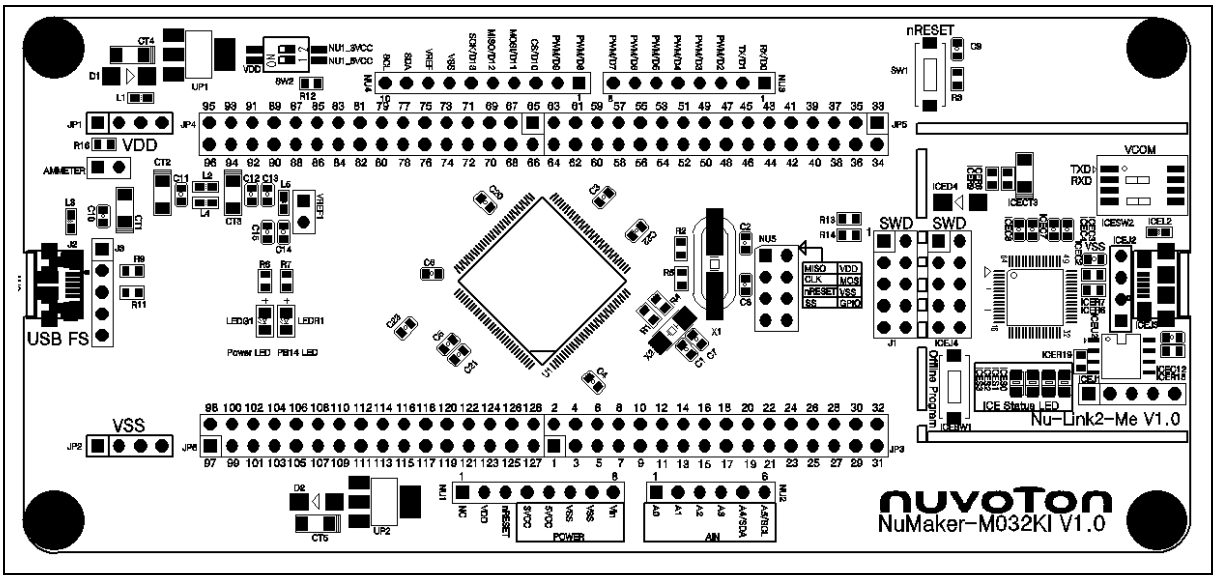


Figure 8-4 Front Placement

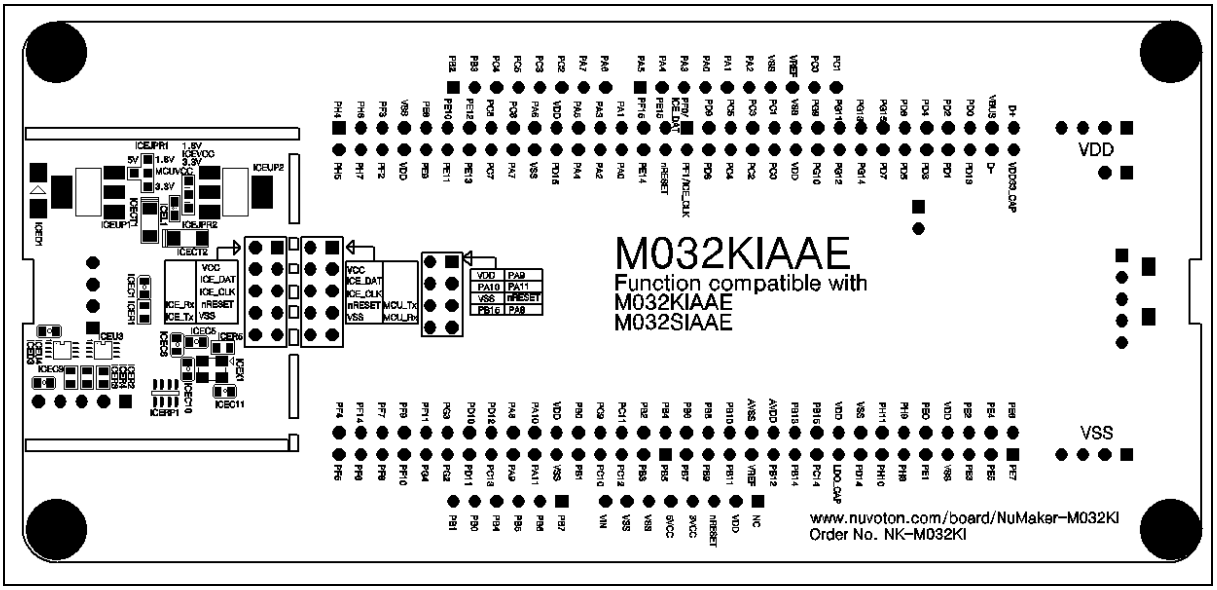


Figure 8-5 Rear Placement

9 REVISION HISTORY

Date	Revision	Description
2022.03.25	1.00	• Initial version

Important Notice

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Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.