NuMicro® Family

Arm® Cortex®-M33-based Microcontroller

NuMaker-M3333SG

User Manual

Evaluation Board for NuMicro® M3331 Series

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1 OVERVIEW

The NuMaker-M3333SG is an evaluation board for Nuvoton NuMicro M3333SG, M3333LG, M3333YG and M3333TG microcontrollers. The NuMaker-M3333SG consists of two parts: an M3333SG target board and an on-board Nu-Link2-Me debugger and programmer. The NuMaker-M3333SG is designed for project evaluation, prototype development and validation with power consumption monitoring function.

The M3333SG target board is based on NuMicro M3333SGAAE. For the development flexibility, the M3333SG 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.

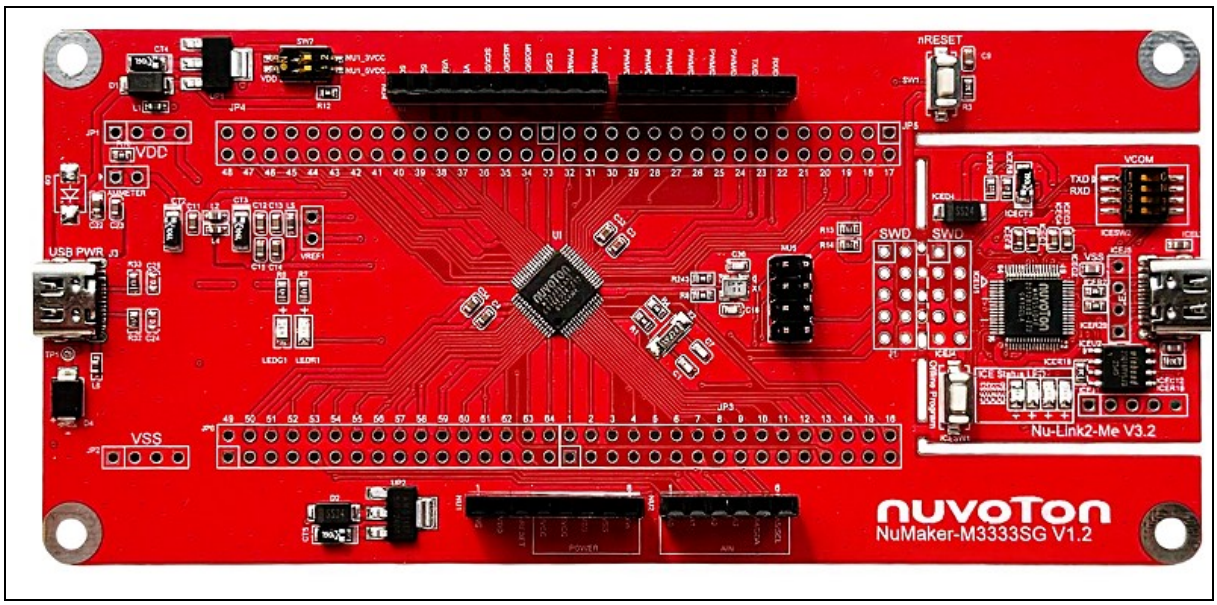


Figure 1-1 NuMaker-M3333SG Evaluation Board

2 FEATURES

- NuMicro M3333SGAAE used as main microcontroller with function compatible with:
  - M3333SGAAE
  - M3333LGAAE
  - M3333YGAAE
  - M3333TGAAE
- M3333SGAAE 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 PWR connector on M3333SG 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 HARDWARE CONFIGURATION

3.1 Front View

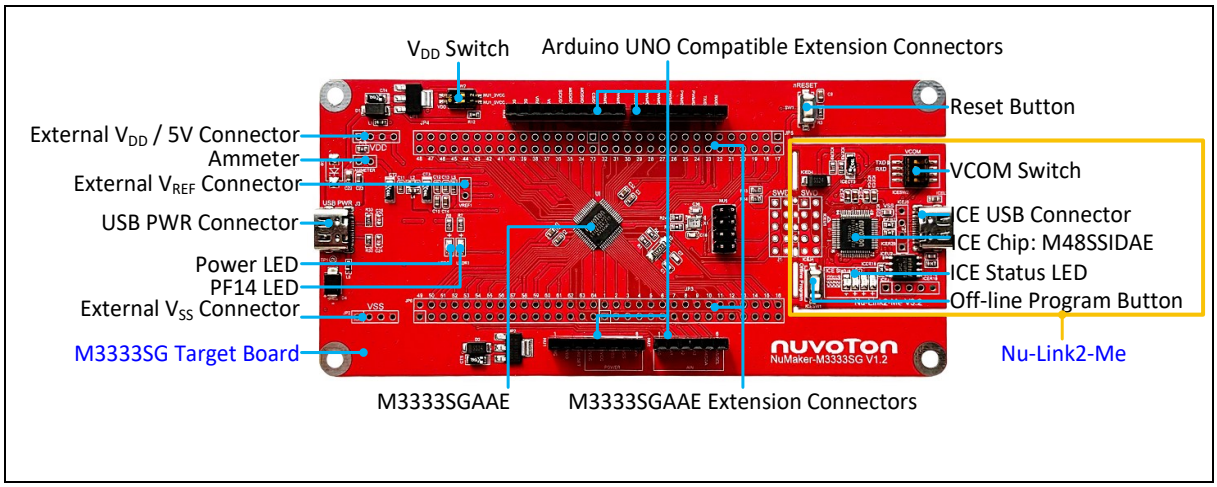


Figure 3-1 Front View of NuMaker-M3333SG

Figure 3-1 shows the main components and connectors from the front side of NuMaker-M3333SG. The following lists components and connectors from the front view:

- Target chip: M3333SGAAE (U1)
- USB PWR Connector (J3)
- Arduino UNO Compatible Extension Connectors (NU1, NU2, NU3, NU4)
- M3333SG 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 (ICEJ2)
  - ICE Status LED (ICES0, ICES1, ICES2, ICES3)
  - Offline Program Button (ICESW1)

3.2 Rear View

Figure 3-2 shows the main components and connectors from the rear side of NuMaker-M3333SG.

The following lists components and connectors from the rear view:

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

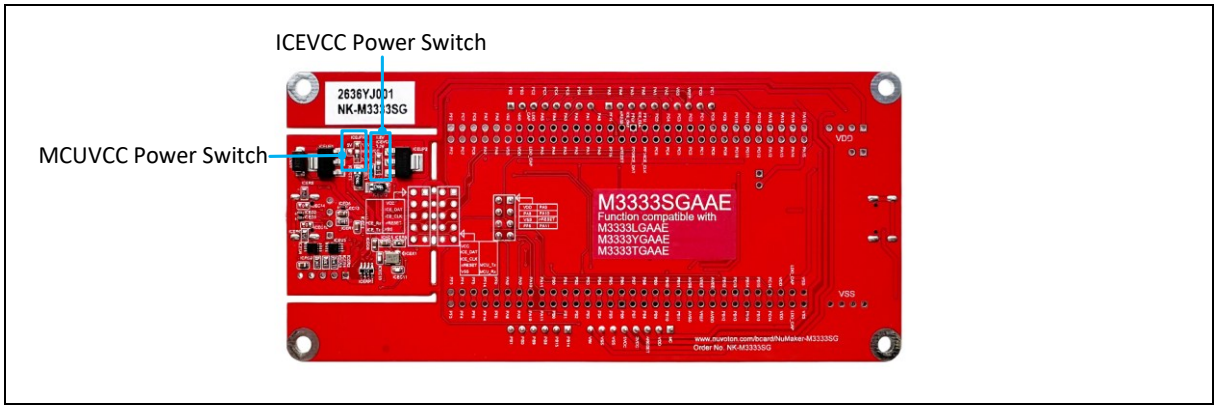


Figure 3-2 Rear View of NuMaker-M3333SG

3.3 Extension Connectors

Table 3-1 presents the extension connectors.

Connector	Description
JP3, JP4, JP5 and JP6	Full pins extension connectors on the NuMaker-M3333SG.
NU1, NU2, NU3 and NU4	Arduino UNO compatible pins on the NuMaker-M3333SG.

Table 3-1 Extension Connectors

3.3.1 Pin Assignment for Extension Connectors

The NuMaker-M3333SG provides the M3333SGAAE onboard and extension connectors (JP3, JP4, JP5 and JP6). Figure 3-3 shows the M3333SGAAE extension connectors.

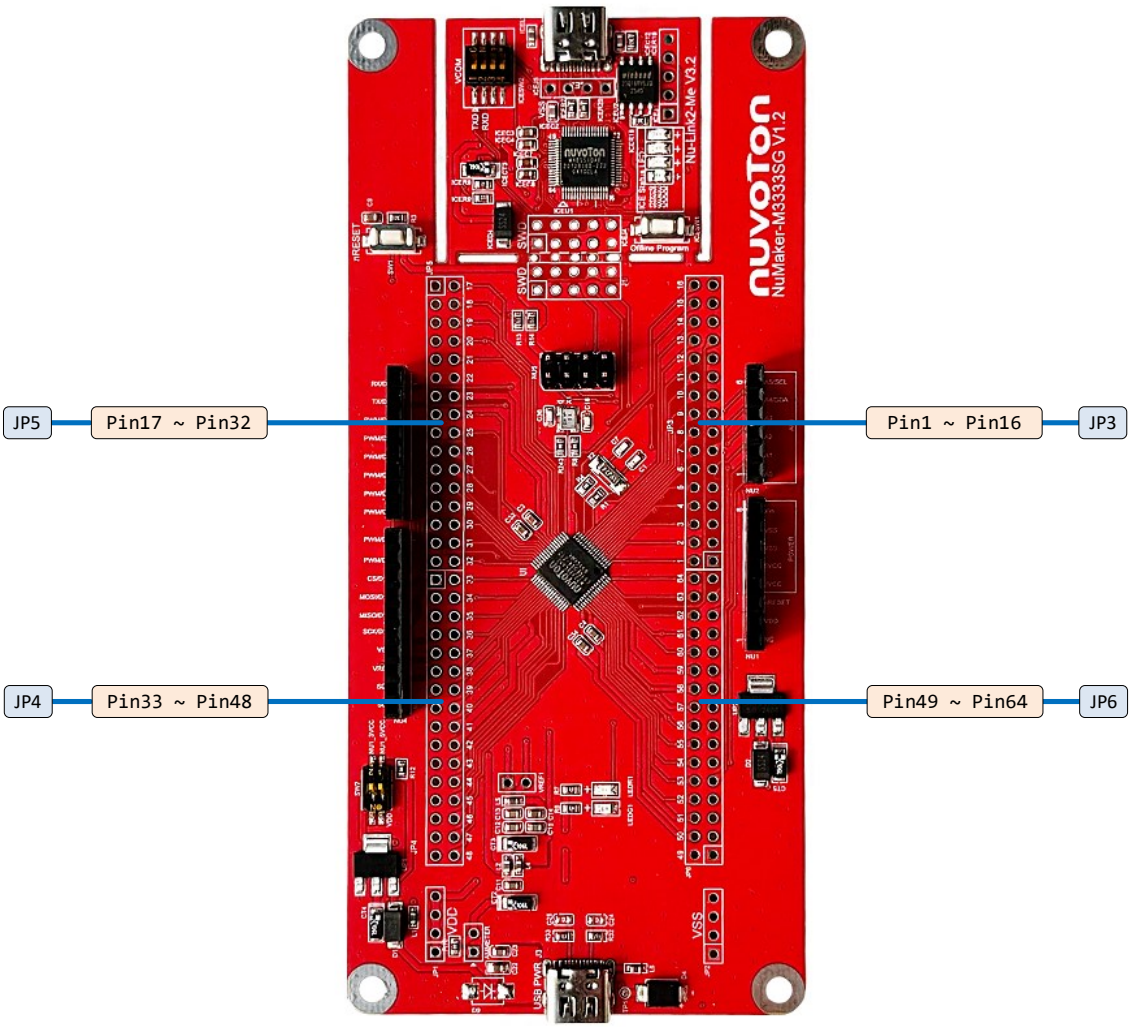


Figure 3-3 M3333SGAAE Extension Connectors

Header		M3333SGAAE	
		Pin No.	Function
JP3	JP3.1	1	PB.6 / EADC0_CH6 / EPWM0_SYNC_IN / UART1_RXD / SPI0_CLK / BPWM1_CH5 / EPWM1_BRAKE1 / EPWM1_CH5 / INT4 / TM1
	JP3.2	2	PB.5 / EADC0_CH5 / SPI1_MISO / I2C0_SCL / EPWM0_CH0 / UART2_TXD / TM0 / INT0 / LLSI4_OUT
	JP3.3	3	PB.4 / EADC0_CH4 / SPI1_MOSI / I2C0_SDA / EPWM0_CH1 / UART2_RXD / TM1 / INT1 / LLSI5_OUT
	JP3.4	4	PB.3 / EADC0_CH3 / SPI1_CLK / UART1_TXD / EPWM0_CH2 / I2C1_SCL / TM2 / INT2 / LLSI6_OUT
	JP3.5	5	PB.2 / EADC0_CH2 / SPI1_SS / UART1_RXD / EPWM0_CH3 / I2C1_SDA / TM3 / INT3 / LLSI7_OUT
	JP3.6	6	PB.1 / EADC0_CH1 / SPI1_I2SMCLK / UART2_TXD / I2C1_SCL / EPWM0_CH4 / EPWM1_CH4 / EPWM0_BRAKE0 / QSPI0_MISO1
	JP3.7	7	PB.0 / EADC0_CH0 / USCI0_CTL0 / UART2_RXD / SPI0_I2SMCLK / I2C1_SDA / EPWM0_CH5 / EPWM1_CH5 / EPWM0_BRAKE1 / QSPI0_MOSI1
	JP3.8	8	PA.11 / USCI0_CLK / BPWM0_CH0 / EPWM0_SYNC_OUT / EPWM0_BRAKE1 / TM0_EXT
	JP3.9	9	PA.10 / USCI0_DAT0 / BPWM0_CH1 / ECAP0_IC0 / TM1_EXT
	JP3.10	10	PA.9 / USCI0_DAT1 / UART1_TXD / BPWM0_CH2 / ECAP0_IC1 / TM2_EXT
	JP3.11	11	PA.8 / USCI0_CTL1 / UART1_RXD / BPWM0_CH3 / ECAP0_IC2 / TM3_EXT / INT4
	JP3.12	12	PF.6 / SPI0_MOSI / TRACE_SWO
	JP3.13	13	PF.14 / LLSI3_OUT
	JP3.14	14	PF.5 / UART2_RXD / UART2_nCTS / UART0_nCTS / UART3_TXD / EPWM0_CH0 / BPWM0_CH4 / EPWM0_SYNC_OUT / X32_IN / EADC0_ST
	JP3.15	15	PF.4 / UART2_TXD / UART2_nRTS / UART0_nRTS / UART3_RXD / EPWM0_CH1 / BPWM0_CH5 / X32_OUT
	JP3.16	16	PF.3 / UART0_TXD / I2C0_SCL / SPI1_CLK / EPWM1_CH0 / XT1_IN / BPWM1_CH0 / TM0_EXT
JP5	JP5.1	17	PF.2 / UART0_RXD / I2C0_SDA / QSPI0_CLK / SPI1_SS / EPWM1_CH1 / XT1_OUT / BPWM1_CH1 / TM1_EXT
	JP5.2	18	PC.7 / SPI1_MISO / UART0_nCTS / I2C1_SMBAL / EPWM1_CH2 / BPWM1_CH0 / TM0 / INT3
	JP5.3	19	PC.6 / SPI1_MOSI / UART0_nRTS / I2C1_SMBSUS / EPWM1_CH3 / BPWM1_CH1 / TM1 / INT2
	JP5.4	20	PA.7 / SPI1_CLK / UART0_TXD / I2C1_SCL / EPWM1_CH4 / BPWM1_CH2 / TM2 / INT1
	JP5.5	21	PA.6 / SPI1_SS / CANFD0_TXL / UART0_RXD / I2C1_SDA / EPWM1_CH5 / BPWM1_CH3 / TM3 / INT0
	JP5.6	22	V_{SS}
	JP5.7	23	V_{DD}
	JP5.8	24	LDO_CAP
	JP5.9	25	PA.5 / SPI1_MISO / QSPI0_MISO1 / SPI1_I2SMCLK / CANFD0_TXH / UART0_nCTS / I2C0_SCL / CANFD0_TXD / UART0_TXD / BPWM0_CH5 / EPWM0_CH0 / EQEI0_INDEX
	JP5.10	26	PA.4 / SPI1_MOSI / QSPI0_MOSI1 / SPI0_I2SMCLK / UART0_nRTS / I2C0_SDA / CANFD0_RXD / UART0_RXD / BPWM0_CH4 / EPWM0_CH1 / EQEI0_A
	JP5.11	27	PA.3 / QSPI0_SS / SPI0_SS / UART1_TXD / I2C1_SCL / I2C0_SMBAL / BPWM0_CH3 / EPWM0_CH2 / EQEI0_B / EPWM1_BRAKE1 / LLSI4_OUT
	JP5.12	28	PA.2 / QSPI0_CLK / SPI0_CLK / UART1_RXD / I2C1_SDA / I2C0_SMBSUS / BPWM0_CH2 / EPWM0_CH3 / LLSI5_OUT
	JP5.13	29	PA.1 / QSPI0_MISO0 / SPI0_MISO / UART0_TXD / UART1_nCTS / BPWM0_CH1 / EPWM0_CH4 / LLSI6_OUT
	JP5.14	30	PA.0 / QSPI0_MOSI0 / SPI0_MOSI / UART0_RXD / UART1_nRTS / BPWM0_CH0 / EPWM0_CH5 / LLSI7_OUT
	JP5.15	31	PF.15
	JP5.16	32	nRESET
JP4	JP4.1	33	PF.0 / UART1_TXD / I2C1_SCL / UART0_TXD / SPI0_CLK / USCI0_CTL1 / UART2_TXD / I2C0_SCL / EPWM1_CH4 / ICE_DAT / EADC0_ST

Header		M3333SGAAE	
		Pin No.	Function
	JP4.2	34	PF.1 / UART1_RXD / I2C1_SDA / UART0_RXD / SPI0_SS / USCI0_DAT1 / UART2_RXD / I2C0_SDA / EPWM1_CH5 / ICE_CLK
	JP4.3	35	PC.5 / QSPI0_MISO1 / CANFD0_TXH / UART2_TXD / I2C1_SCL / CANFD0_TXD / EPWM1_CH0 / LLSI0_OUT
	JP4.4	36	PC.4 / QSPI0_MOSI1 / SPI1_I2SMCLK / UART2_RXD / I2C1_SDA / CANFD0_RXD / EPWM1_CH1 / LLSI1_OUT
	JP4.5	37	PC.3 / QSPI0_SS / SPI1_MISO / UART2_nRTS / I2C0_SMBAL / UART3_TXD / EPWM1_CH2 / LLSI2_OUT
	JP4.6	38	PC.2 / QSPI0_CLK / SPI1_MOSI / UART2_nCTS / I2C0_SMBSUS / UART3_RXD / EPWM1_CH3 / LLSI7_OUT / LLSI3_OUT
	JP4.7	39	PC.1 / QSPI0_MISO0 / SPI1_CLK / UART2_TXD / I2C0_SCL / EPWM1_CH4 / EADC0_ST / LLSI8_OUT
	JP4.8	40	PC.0 / QSPI0_MOSI0 / SPI1_SS / UART2_RXD / I2C0_SDA / EPWM1_CH5 / LLSI9_OUT
	JP4.9	41	PG.9 / BPWM0_CH5
	JP4.10	42	PG.10 / BPWM0_CH4
	JP4.11	43	PG.11 / BPWM0_CH3
	JP4.12	44	PG.12 / BPWM0_CH2
	JP4.13	45	PA.12 / I2C1_SCL / CANFD0_TXD / CANFD0_TXH / BPWM1_CH2
	JP4.14	46	PA.13 / I2C1_SDA / CANFD0_RXD / BPWM1_CH3
	JP4.15	47	PA.14 / UART0_TXD / BPWM1_CH4
	JP4.16	48	PA.15 / UART0_RXD / BPWM1_CH5 / EPWM0_SYNC_IN
JP6	JP6.1	49	V_{SS}
	JP6.2	50	LDO_CAP
	JP6.3	51	V_{DD}
	JP6.4	52	PC.14 / SPI0_I2SMCLK / USCI0_CTL0 / QSPI0_CLK / TRACE_SWO / EPWM0_SYNC_IN / TM1
	JP6.5	53	PB.15 / EADC0_CH15 / SPI0_SS / USCI0_CTL1 / UART0_nCTS / UART3_TXD / EPWM0_BRAKE1 / EPWM1_CH0 / TM0_EXT / LLSI0_OUT
	JP6.6	54	PB.14 / EADC0_CH14 / SPI0_CLK / USCI0_DAT1 / UART0_nRTS / UART3_RXD / EPWM1_CH1 / TM1_EXT / CLKO / LLSI1_OUT
	JP6.7	55	PB.13 / EADC0_CH13 / SPI0_MISO / USCI0_DAT0 / UART0_TXD / UART3_nRTS / CLKO / EPWM1_CH2 / USCI0_CTL0 / TM2_EXT / LLSI2_OUT
	JP6.8	56	PB.12 / EADC0_CH12 / CANFD0_TXL / SPI0_MOSI / USCI0_CLK / UART0_RXD / UART3_nCTS / EPWM1_CH3 / QSPI0_CLK / TM3_EXT / SPI0_I2SMCLK / LLSI3_OUT
	JP6.9	57	AV_{DD}
	JP6.10	58	V_{REF}
	JP6.11	59	AV_{SS}
	JP6.12	60	PB.11 / EADC0_CH11 / CANFD0_TXH / UART0_nCTS / I2C1_SCL / CANFD0_TXD / SPI0_I2SMCLK / BPWM1_CH0 / LLSI8_OUT
	JP6.13	61	PB.10 / EADC0_CH10 / UART0_nRTS / I2C1_SDA / CANFD0_RXD / BPWM1_CH1 / LLSI9_OUT
	JP6.14	62	PB.9 / EADC0_CH9 / UART0_TXD / UART1_nCTS / I2C1_SMBAL / I2C0_SCL / BPWM1_CH2 / INT7
	JP6.15	63	PB.8 / EADC0_CH8 / UART0_RXD / UART1_nRTS / I2C1_SMBSUS / I2C0_SDA / BPWM1_CH3 / INT6
	JP6.16	64	PB.7 / EADC0_CH7 / UART1_TXD / SPI0_SS / BPWM1_CH4 / EPWM1_BRAKE0 / EPWM1_CH4 / INT5

Table 3-2 M3333SGAAE Full-pin Extension Connectors and GPIO Function List

3.3.2 Arduino UNO Compatible Extension Connectors

Figure 3-4 shows the Arduino UNO compatible extension connectors.

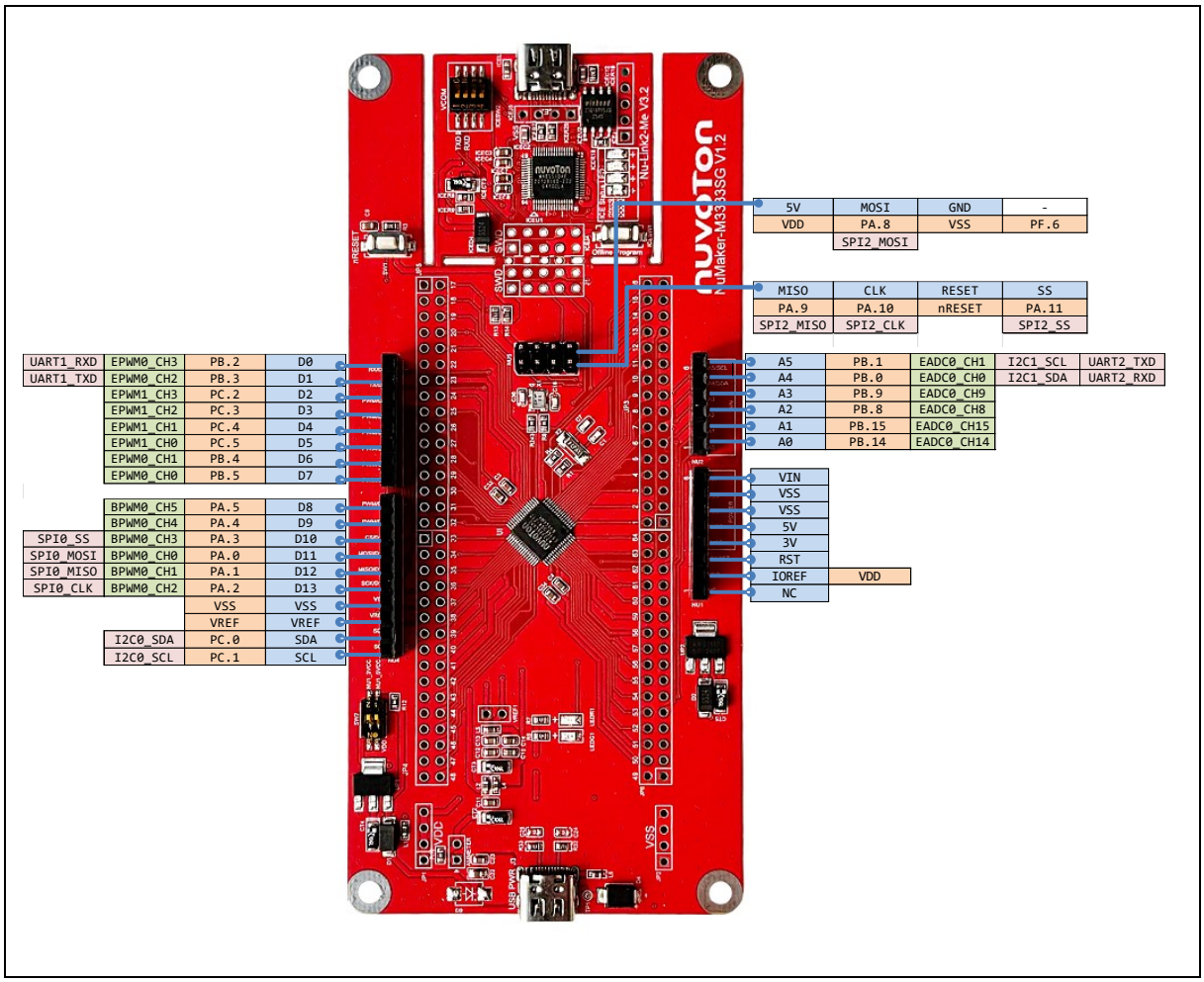


Figure 3-4 Arduino UNO Compatible Extension Connectors

Header		NuMaker-M3333SG		Header		NuMaker-M3333SG	
		Compatible to Arduino UNO	GPIO Pin of M3333SGAAE			Compatible to Arduino UNO	GPIO Pin of M3333SGAAE
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.2		NU2.4	A3	PB.9
	NU3.4	D3	PC.3		NU2.3	A2	PB.8
	NU3.5	D4	PC.4		NU2.2	A1	PB.15
	NU3.6	D5	PC.5		NU2.1	A0	PB.14
	NU3.7	D6	PB.4	NU1	NU1.8	VIN	-
	NU3.8	D7	PB.5		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 3-3 Arduino UNO Extension Connectors and M3333SGAAE Mapping GPIO List

3.4 Power Supply Configuration

The NuMaker-M3333SG is able to adopt multiple power supplies. External power sources include NU1 Vin (7V to 12V), 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-M3333SG.

3.4.1 VIN Power Source

Table 3-4 presents the Vin power source.

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

Table 3-4 Vin Power Source

3.4.2 5V Power Sources

Table 3-5 presents the 5V power sources.

Connector	Net Name in Schematic	Description
ICEJ2	USB_HS_VBUS	ICE USB connector supplies 5V power from PC to M3333SG target board and Nu-Link2-Me.
J3	USB_VBUS	USB connector on NuMaker-M3333SG supplies 5V power from PC to M3333SG target board and Nu-Link2-Me.
NU1 pin5	NU1_5VCC	ICEJ2, J3 or NU1 pin8 supplies 5V power to NU1 pin5. NU1 pin5 supplies 5V power to target chip or Arduino adapter board. **Note:** The operating voltage range of M3331 series is from 1.8V to 3.6V. Do not switch SW2.1 (NU1 5VCC) to ON.

Table 3-5 5V Power Sources

3.4.3 3.3V Power Sources

Table 3-6 presents the 3.3V power sources.

Voltage Regulator	5V Source	Description
ICEUP1	USB_HS_VBUS	ICEUP1 converts USB_HS_VBUS to 3.3V and supplies 3.3V to M3333SG target board or ICE chip.
UP1	USB_VBUS	UP1 converts USB_VBUS to 3.3V and supplies 3.3V to M3333SG target board. **Note:** SW2.2 (NU1 3VCC) should be switched to ON.
UP1	NU1_5VCC	UP1 converts NU1_5VCC to 3.3V and supplies 3.3V to M3333SG target board. **Note:** SW2.2 (NU1 3VCC) should be switched to ON.

Table 3-6 3.3V Power Sources

3.4.4 1.8V Power Sources

Table 3-7 presents the 1.8V power source.

Voltage Regular	5V Source	Description
ICEUP2	USB_HS_VBUS	ICEUP2 converts USB_HS_VBUS to 1.8V and supplies 1.8V to M3333SG target board or ICE chip.

Table 3-7 1.8V Power Sources

3.4.5 Power Connectors

Table 3-8 presents the power connectors.

Connector	Description
JP1	V_{DD} connector on the NuMaker-M3333SG. **Note:** The operating voltage range of M3331 series is from 1.8V to 3.6V.
JP2	V_{SS} connector on the NuMaker-M3333SG.
JP7	NU1_5VCC connector on the NuMaker-M3333SG.

Table 3-8 Power Connectors

3.4.6 USB Connectors

Table 3-9 presents the USB connectors.

Connector	Description
ICEJ2	ICE USB connector on Nu-Link2-Me for power supply, debugging and programming from PC.
J3	USB PWR connector on NuMaker-M3333SG for power supply.

Table 3-9 USB Connectors

3.4.7 Power Switches

Table 3-10 presents the power switches.

Switch	Description
ICEJPR1	Configures the target chip operating voltage at 1.8V / 3.3V / 5V. **Note:** The operating voltage range of M3331 series is from 1.8V to 3.6V. Do not switch ICEJPR1 (MCUVCC) to 5V.
ICEJPR2	Configures the ICE chip operating voltage at 1.8V / 3.3V.
SW2	Configures the target chip operating voltage at 3.3V / 5V. **Note:** The operating voltage range of M3331 series is from 1.8V to 3.6V. Do not switch SW2.1 (NU1 5VCC) to ON.

Table 3-10 Power Switches

3.4.8 Power Supply Models

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

The external power supply source on Nu-Link2-Me is shown in Figure 3-5.



Figure 3-5 External Power Supply Sources on Nu-Link2-Me

To use ICEJ2 as external power supply source with Nu-Link2-Me, please follow the steps below:

1. Solder the resistor on ICEJPR1 (MCUVCC) depending on the target chip operating voltage.
2. Solder the resistor on ICEJPR2 (ICEVCC) depending on the ICE chip operating voltage.
3. Switch the SW2 to OFF.
4. Connect the external power supply to ICEJ2.

Table 3-11 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	ICEJ2	ICEJPR1 (MCUVCC) Selection [1]	ICEJPR2 (ICEVCC) Selection [2]	ICE Chip Voltage	SW2 Selection	J3	Vin	JP1
1	1.8V	Connect to PC	1.8V	1.8V	1.8V	Off	-	-	1.8V output
2	3.3V	Connect to PC	3.3V (default)	3.3V (default)	3.3V	Off	-	-	3.3V output
3	5V	Connect to PC	5V	3.3V (default)	3.3V	Off	-	-	5V output

Note:

1. 0 Ω should be soldered between ICEJPR1's MCUVCC and 1.8V / 3.3V / 5V.
2. 0 Ω should be soldered between ICEJPR2's ICEVCC and 1.8V / 3.3V.
3. -: Unused.

Table 3-11 Supply External Power through Nu-Link2-Me

3.4.8.2 External Power Supply through M3333SG Target Board to Target Chip

The external power supply sources on M3333SG target board are shown in Figure 3-6.

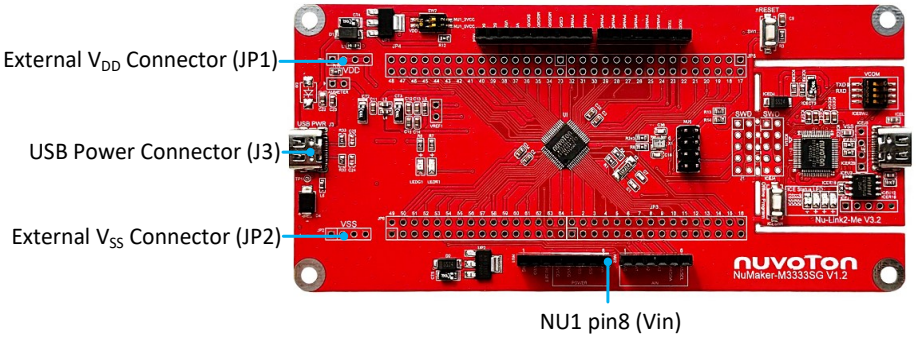


Figure 3-6 External Power Supply Sources on M3333SG Target Board

To use Vin or J3 as external power supply source, please follow the steps below:

1. Switch the SW2 depending on the target chip operating voltage.
2. Remove the resistor on ICEJPR1 (MCUVCC).
3. Solder the resistor on ICEJPR2 (ICEVCC) depending on the ICE chip operating voltage.
4. Connect the external power supply to Vin or J3.

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

1. Switch the SW2 to OFF.
2. Remove the resistor on ICEJPR1 (MCUVCC).
3. Solder the resistor on ICEJPR2 (ICEVCC) depending on the ICE chip operating voltage.
4. Connect ICEJ2 to PC.
5. Connect the external power supply to JP1.

To use Vin or J3 as external power supply source with Nu-Link2-Me detached from NuMaker-M3333SG, please follow the steps below:

1. Switch the SW2 depending on the target chip operating voltage.

2. Detach the Nu-Link2-Me from NuMaker-M3333SG.
3. Connect the external power supply to Vin or J3.

To use JP1 as external power supply source with Nu-Link2-Me detached from NuMaker-M3333SG, please follow the steps below:

1. Switch the SW2 to OFF.
2. Detach the Nu-Link2-Me from NuMaker-M3333SG.
3. Connect the external power supply to JP1.

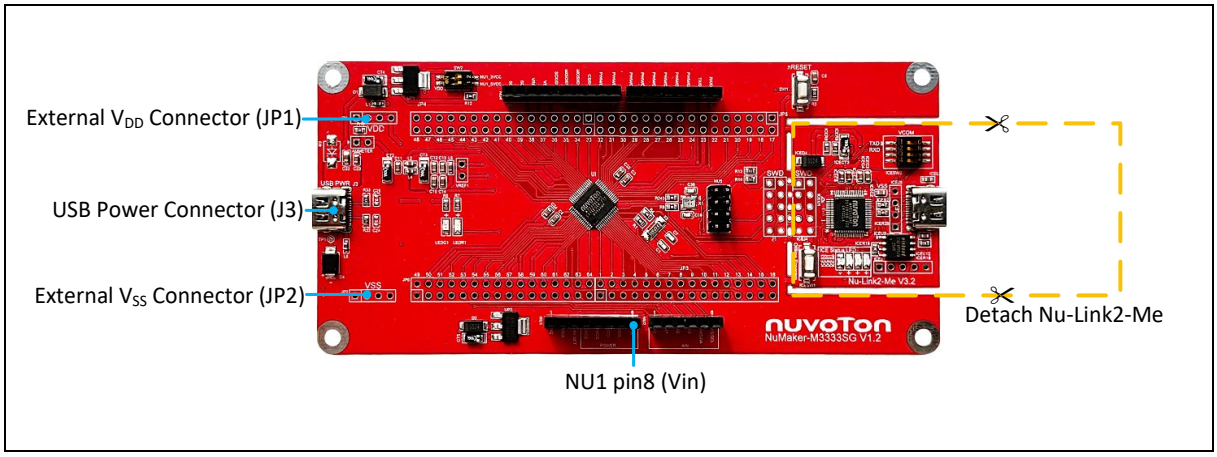


Figure 3-7 Detach the Nu-Link2-Me from NuMaker-M3333SG

Table 3-12 presents all power models when supplies external power through M3333SG target board. The M3333SG target board external power sources are highlighted in yellow.

Model	Target Chip Voltage	Vin [1]	J3[1]	ICEJ2	SW2 Selection	JP1[2]	ICEJPR1 (MCUVCC) Selection [3]	ICEJPR2 (ICEVCC) Selection [4]	ICE Chip Voltage [5]
4	3.3V	7V ~ 12V Input	-	-	NU1 3VCC	3.3V output	Remove resistor	3.3V	3.3V
5	3.3V	-	Connect to PC	-	NU1 3VCC	3.3V output	Remove resistor	3.3V	3.3V
6	1.8V ~ 3.6V	-	-	Connect to PC	OFF	DC Input 1.8V ~ 3.6V	Remove resistor	1.8V / 3.3V	1.8V / 3.3V
7	1.8V ~ 3.6V	-	-	Nu-Link2-Me removed	OFF	DC Input 1.8V ~ 3.6V	-	-	-

Note:

1. The Vin input voltage will be converted by voltage regulator UP2 to 5V. Supplying external power to Vin or J3 can provide 5V to NU1 pin5 (5V) and 3.3V 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 1.8V / 3.3V / 5V.
4. 0 Ω should be soldered between ICEJPR2's ICEVCC and 1.8V / 3.3V.
5. The ICE chip voltage should be close to the target chip voltage.
6. -: Unused

Table 3-12 Supply External Power for M3333SG Target Board

3.5 External Reference Voltage Connector

Table 3-13 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 3-13 External Reference Voltage Connector

3.6 Ammeter Connector

User can refer to the sample code in M3331 series BSP - SYS_PowerDown_MinCurrent and Figure 3-8 to measure the minimum current in Power-down mode. Figure 3-9 shows the path of the sample code, which has relative settings of entering Power-down mode.

Table 3-14 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, set SW2 to OFF, and detach the Nu-Link2-Me.

Table 3-14 Ammeter Connector

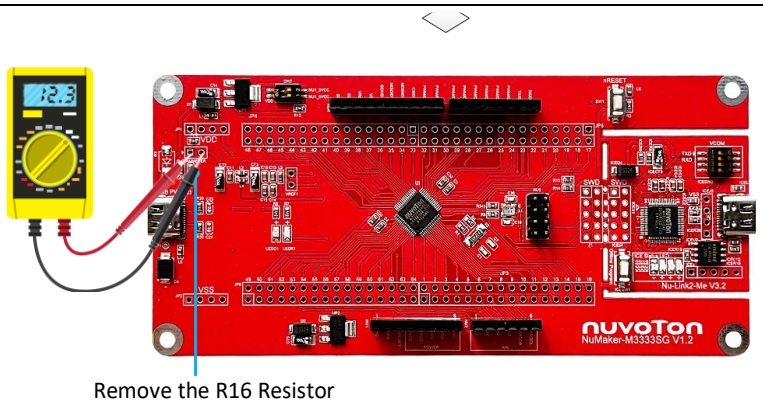


Figure 3-8 Wiring between Ammeter Connector and Ammeter

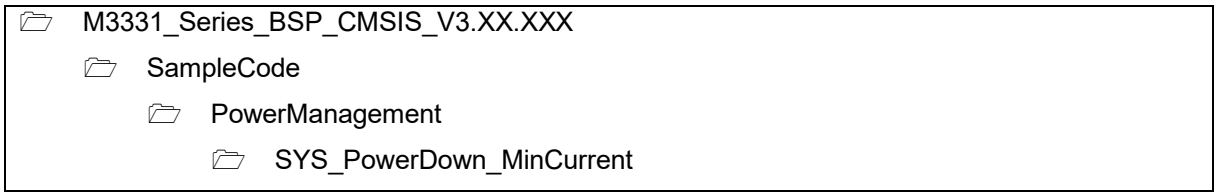


Figure 3-9 Project Path of SYS_PowerDown_MinCurrent

3.7 Push Buttons

Table 3-15 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 3-15 Push Buttons

3.8 LEDs

Table 3-16 presents the LEDs.

Component	Description
Power LED	The power LED indicates that the NuMaker-M3333SG is powered.
PF14 LED	The LED is connected to the target chip PF.14.
ICES0, ICES1, ICES2 and ICES3	Nu-Link2-Me status LED.

Table 3-16 LEDs

3.9 USB Type-C CC Pin Configuration

SW3 is used to configure the CC (Configuration Channel) pins of the USB Type-C connector J3. Through SW3, users can select the USB Type-C role (Sink or Source) or enable MCU-based role control.

Table 3-18 presents the SW3 function.

Application	SW3.1	SW3.2	SW3.3	SW3.4
Sink role	OFF	OFF	OFF	OFF
Source role	OFF	ON	OFF/ON	OFF/ON
MCU-controlled role switching	ON	OFF	ON	ON

Table 3-17 SW3 Switch Functions

3.10 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*.

3.10.1 VCOM Switches

Table 3-18 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 are unused.		

Table 3-18 VCOM Function of Nu-Link2-Me

3.10.2 Status LEDs

Table 3-19 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 3-19 Operation Status LED Patterns

4 QUICK START

4.1 Toolchains Supporting

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

- KEIL MDK Nuvoton Edition - Full Cortex-M
- IAR EWARM
- Visual Studio Code (VS Code)

4.2 Nuvoton Extension Installation

Check subsection 4.2.1 to install the Nuvoton Nu-Link Driver.

Check subsection 4.2.2 to install the Nuvoton NuMicro Cortex-M Pack in Visual Studio Code.

4.2.1 Nu-Link Driver

The Nuvoton Nu-Link Driver is to support Nu-Link to work under Keil MDK or IAR EWARM for all NuMicro Family Devices.

- Download and install Nu-Link_Keil_Driver when using Keil MDK.
- Download and install Nu-Link_IAR_Driver when using IAR EWARM.
- Download and install Nu-Link USB Driver when using VS Code.

Please also install the Nu-Link USB Driver at the end of the installation. The installation process is illustrated in Figure 4-1.

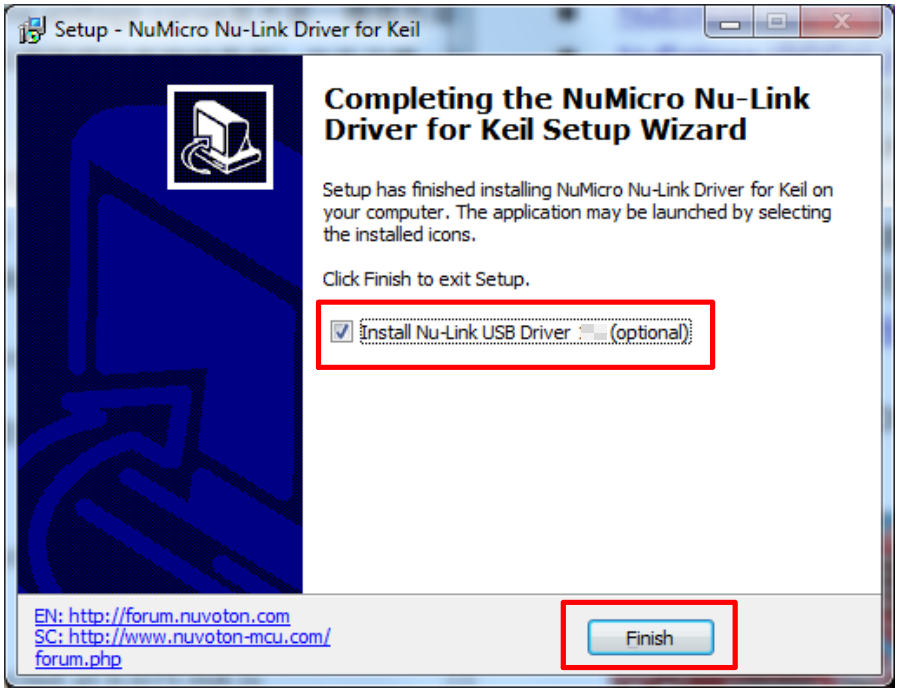


Figure 4-1 Nu-Link USB Driver Installation Setup

4.2.2 Nuvoton NuMicro Cortex-M Pack

The Nuvoton NuMicro Cortex-M Pack is a complete development toolkit for Nuvoton's NuMicro Cortex-M microcontrollers in Visual Studio Code. Launch the VS Code application and install the Nuvoton NuMicro Cortex-M Pack. Please also install the Nu-Link USB Driver after completing the installation. The installation process is illustrated in Figure 4-2. After the installation, activate the Keil MDK Community License by following the steps illustrated in Figure 4-3.

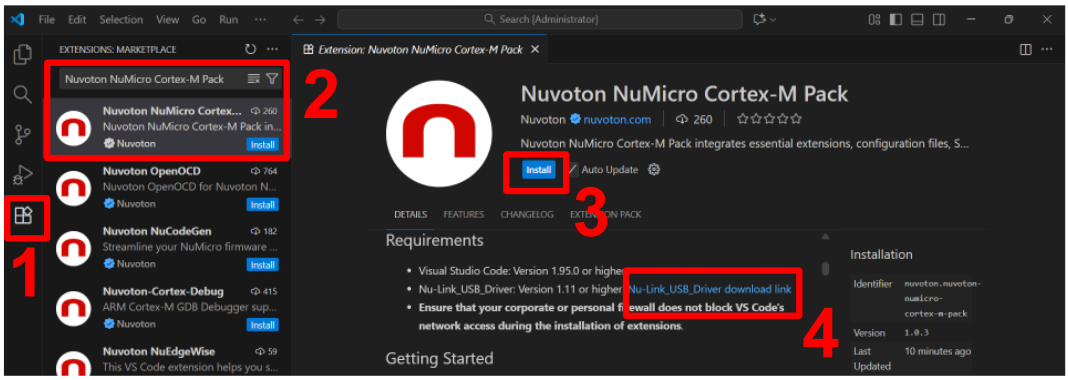


Figure 4-2 Nuvoton NuMicro Cortex-M Pack Installation

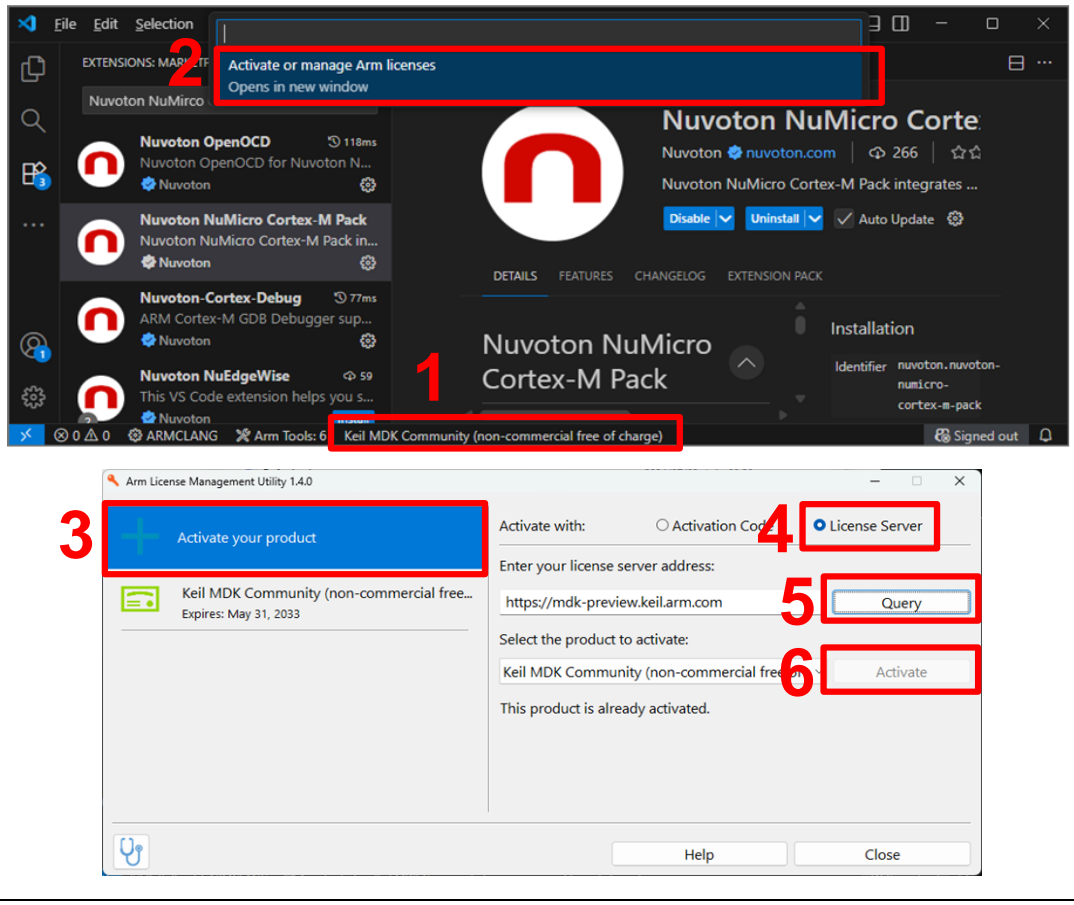


Figure 4-3 Activate Keil MDK Community License

4.3 BSP Firmware Download

Download and unzip the Board Support Package (BSP).

4.4 Hardware Setup

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

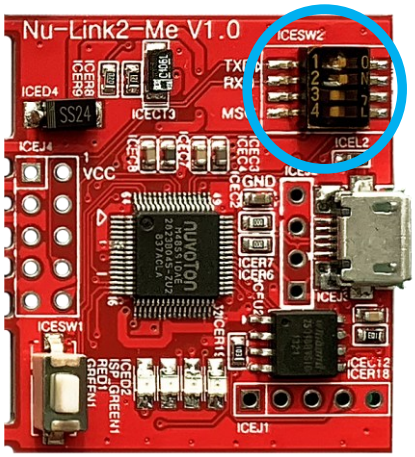


Figure 4-4 Open VCOM Function

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

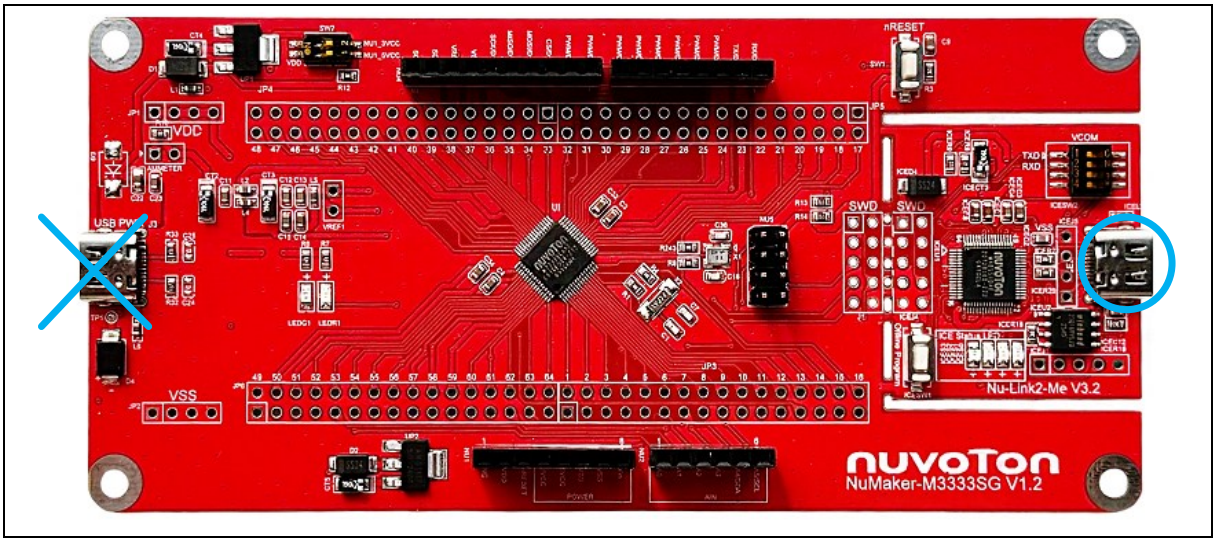


Figure 4-5 ICE USB Connector

3. Find the “Nuvoton Virtual COM Port” on the Device Manager as Figure 4-6.

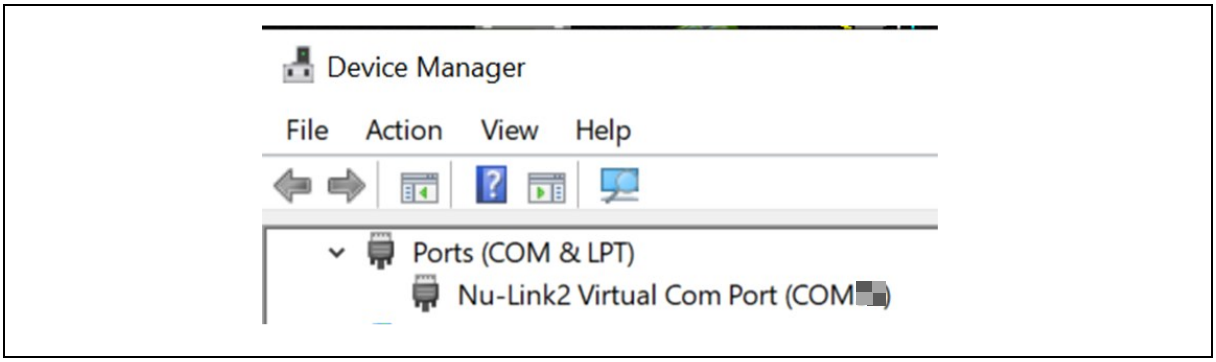


Figure 4-6 Device Manager

4. Open a serial port terminal, PuTTY for example, to print out debug message. Set the speed to 115200. Figure 4-7 presents the PuTTY session setting.

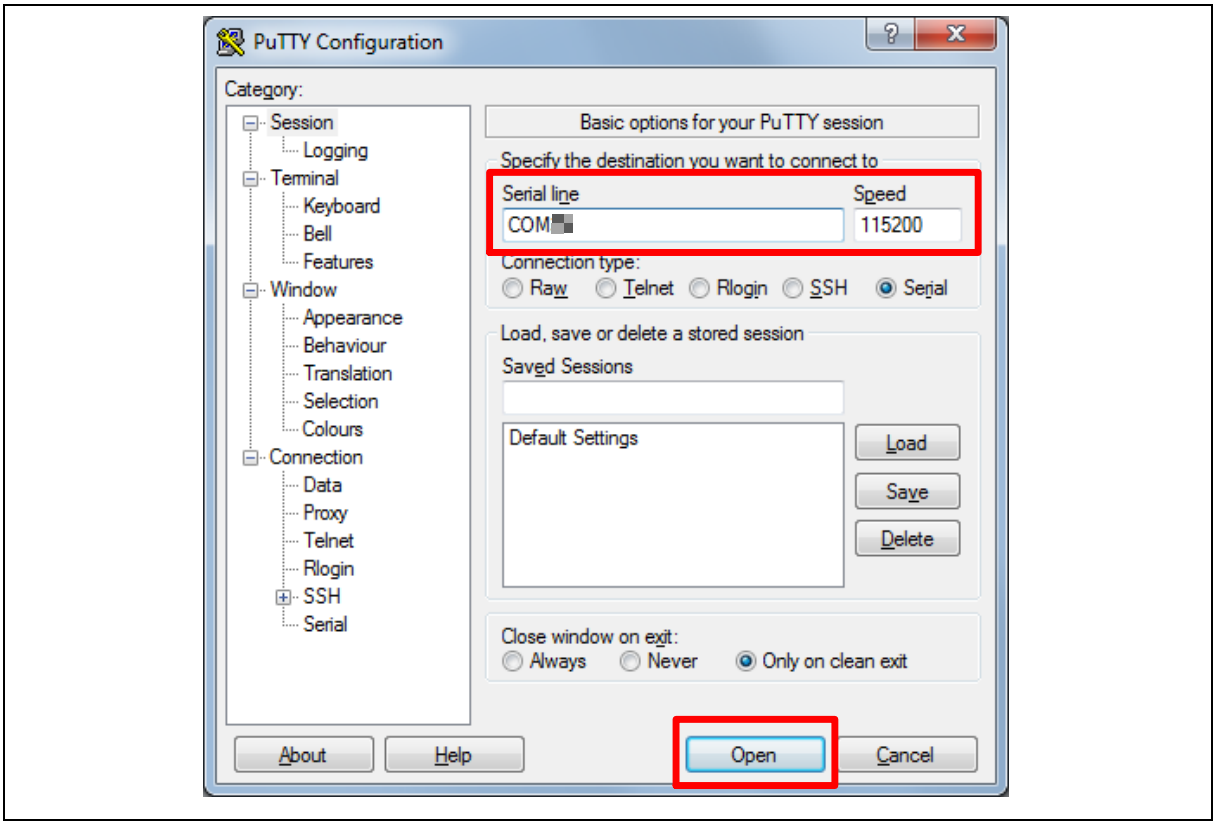


Figure 4-7 PuTTY Session Setting

4.5 Find the Example Project

Use the “Template” project as an example. The project can be found under the BSP folder as shown in Figure 4-8.

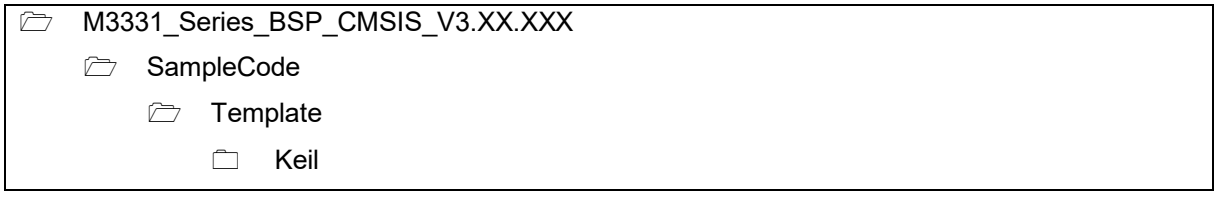




Figure 4-8 Template Project Folder Path

4.6 Execute the Project under Toolchains

Open and execute the project under the toolchain. The subsections describe the steps of executing project in Keil MDK, IAR EWARM and Visual Studio Code respectively.

4.6.1 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.

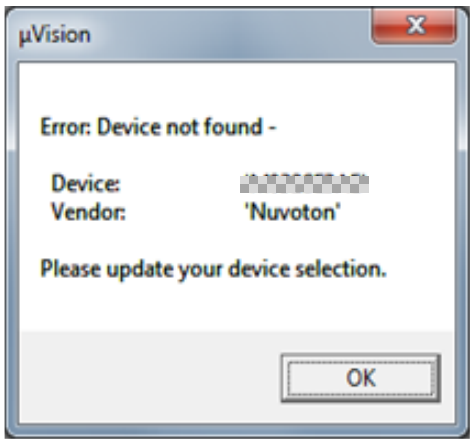


Figure 4-9 Warning Message of “Device not found”

Note: If Figure 4-9 warning message jumps out, please migrate to version 5 format as shown in Figure 4-10. The “.uvproj” filename extension will change to “.uvprojx”.

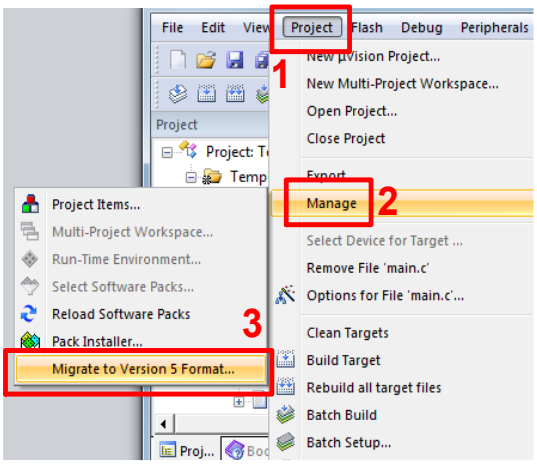


Figure 4-10 Project File Migrate to Version 5 Format

2. Make sure the debugger is “Nuvoton Nu-Link Debugger” as shown in Figure 4-11 and Figure 4-12.

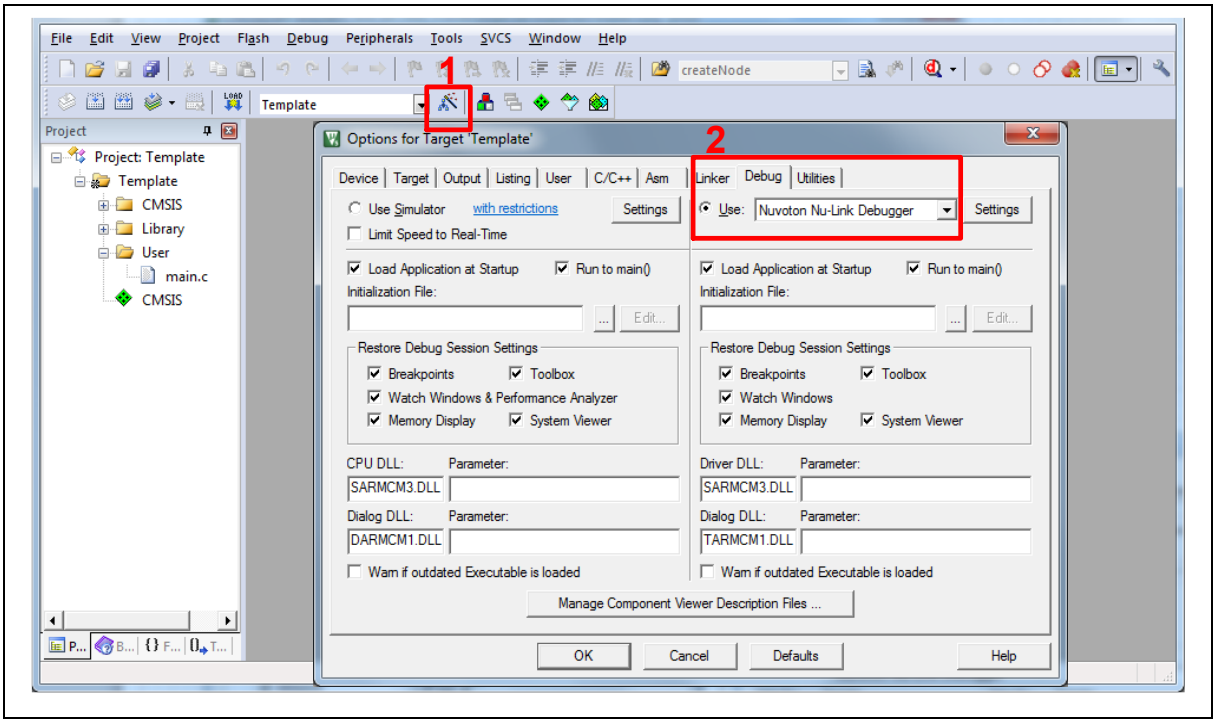


Figure 4-11 Debugger Setting in Options Window

Note: If the dropdown menu in Figure 4-11 does not contain “Nuvoton Nu-Link Debugger” item, please rework section 4.2.

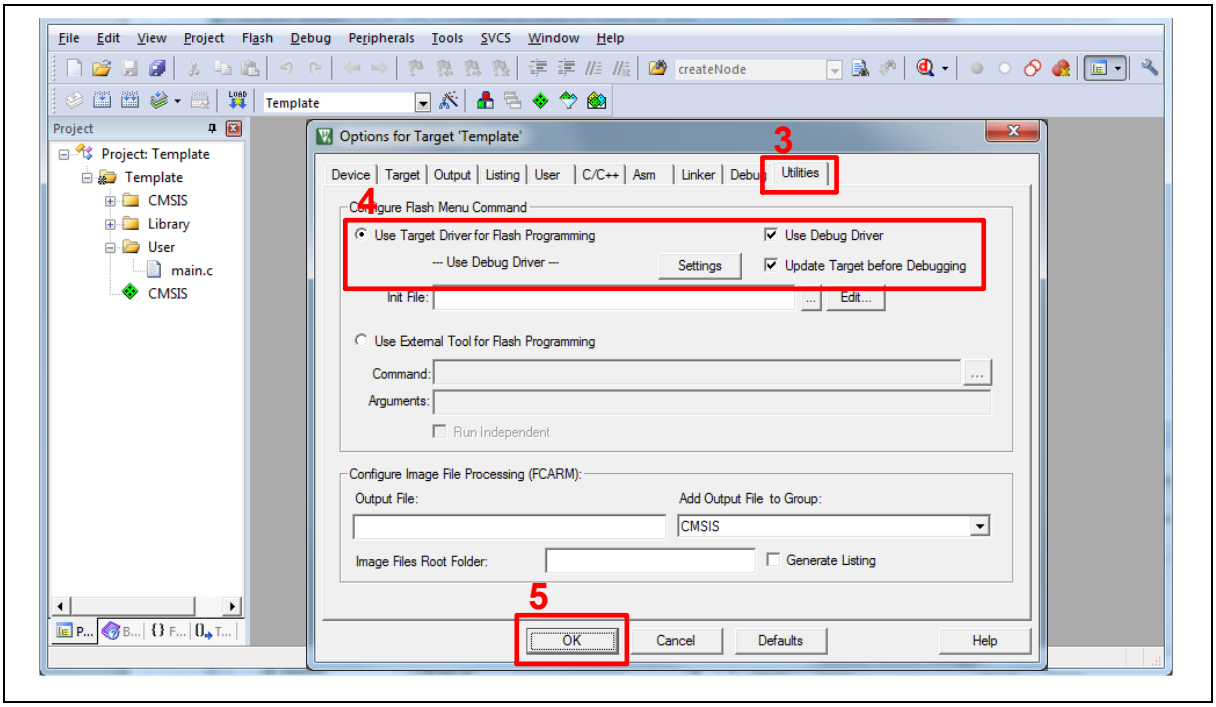


Figure 4-12 Programming Setting in Options Window

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.

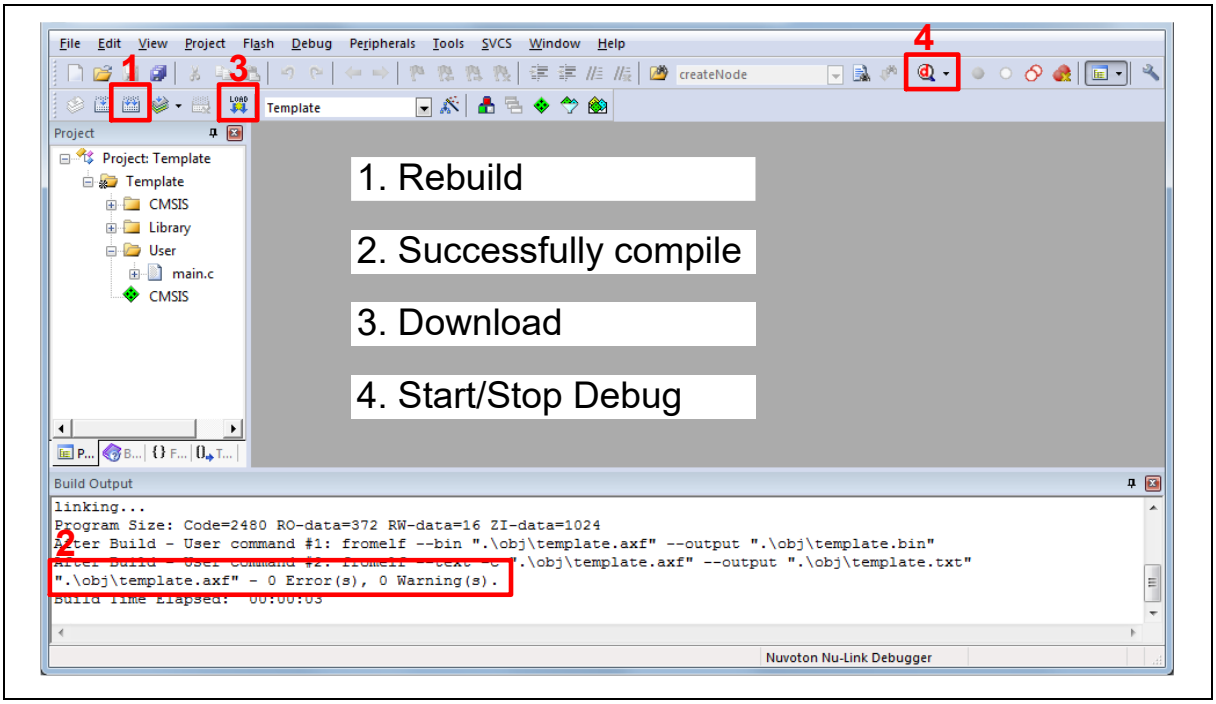


Figure 4-13 Compile and Download the Project

4. Figure 4-14 shows the debug mode under Keil MDK. Click “Run” and the debug message will be printed out as shown in Figure 4-15. User can debug the project under debug mode by checking source code, assembly language, peripherals’ registers, and setting breakpoint, step run, value monitor, etc.

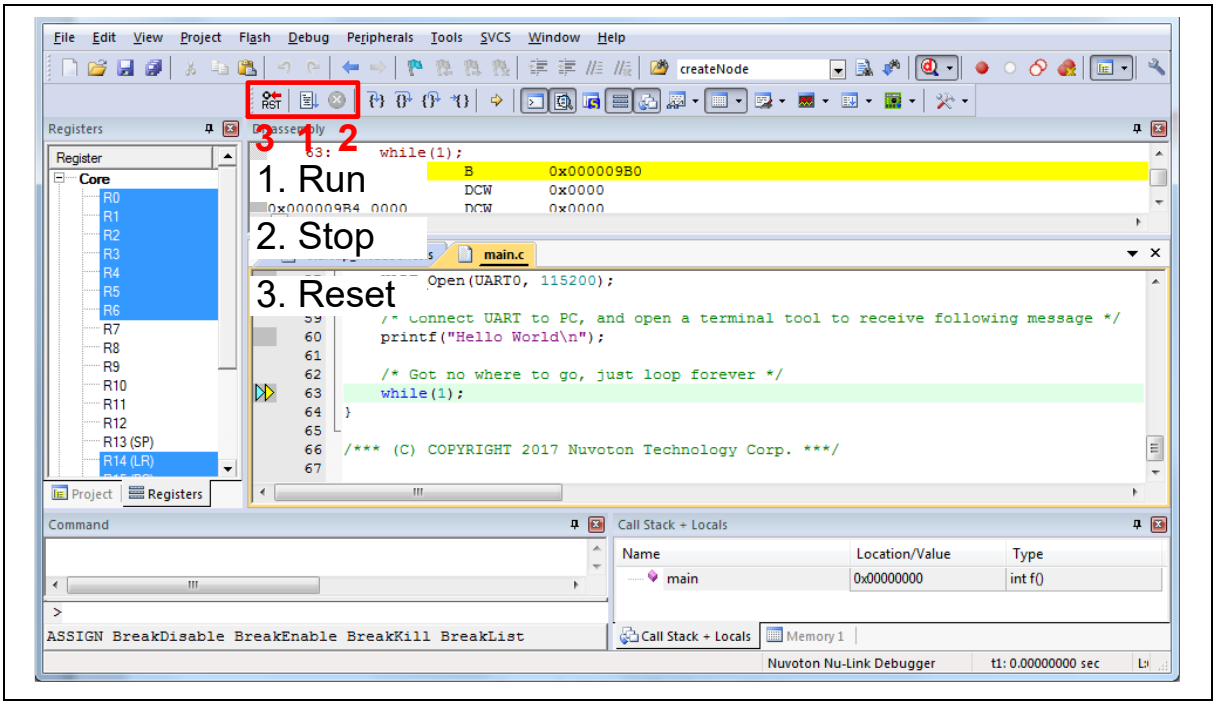


Figure 4-14 Keil MDK Debug Mode

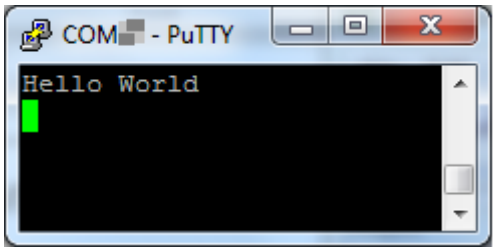


Figure 4-15 Debug Message on Serial Port Terminal Windows

4.6.2 IAR EWARM

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

1. Double click the “Template.eww” to open the project.
2. Make sure the toolbar contains “Nu-Link” item as shown in Figure 4-16.

Note: If the toolbar does not contain “Nu-Link” item, please rework section 4.2.

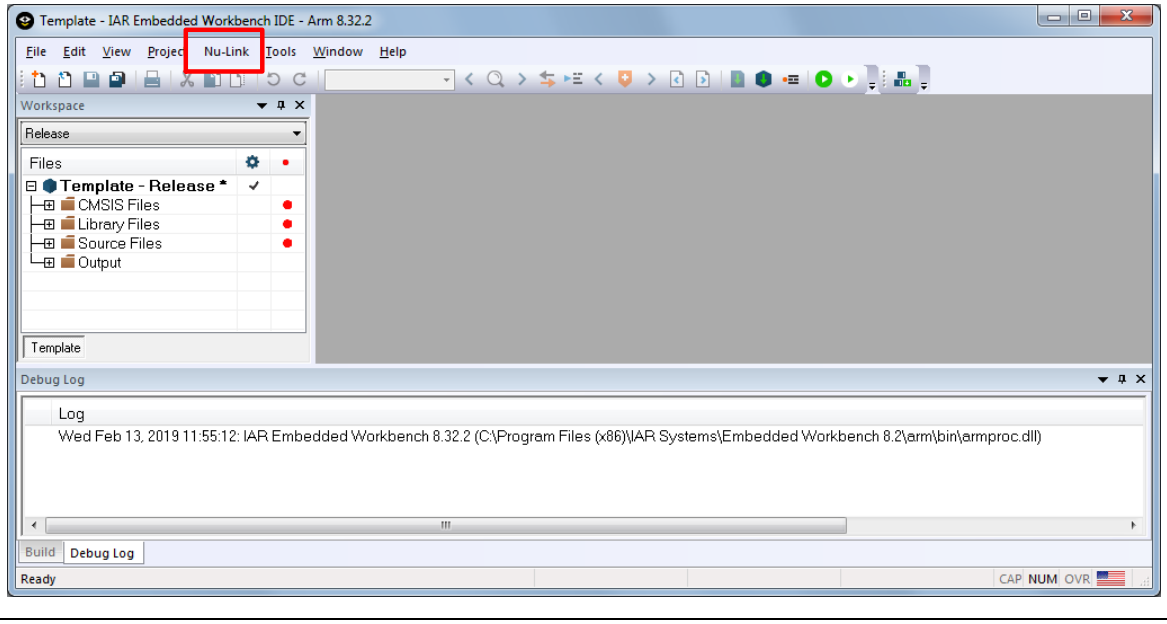


Figure 4-16 IAR EWARM Window

3. Make a target file as presented in Figure 4-17. After successfully compiling the project, download code to the Flash memory and enter debug mode.

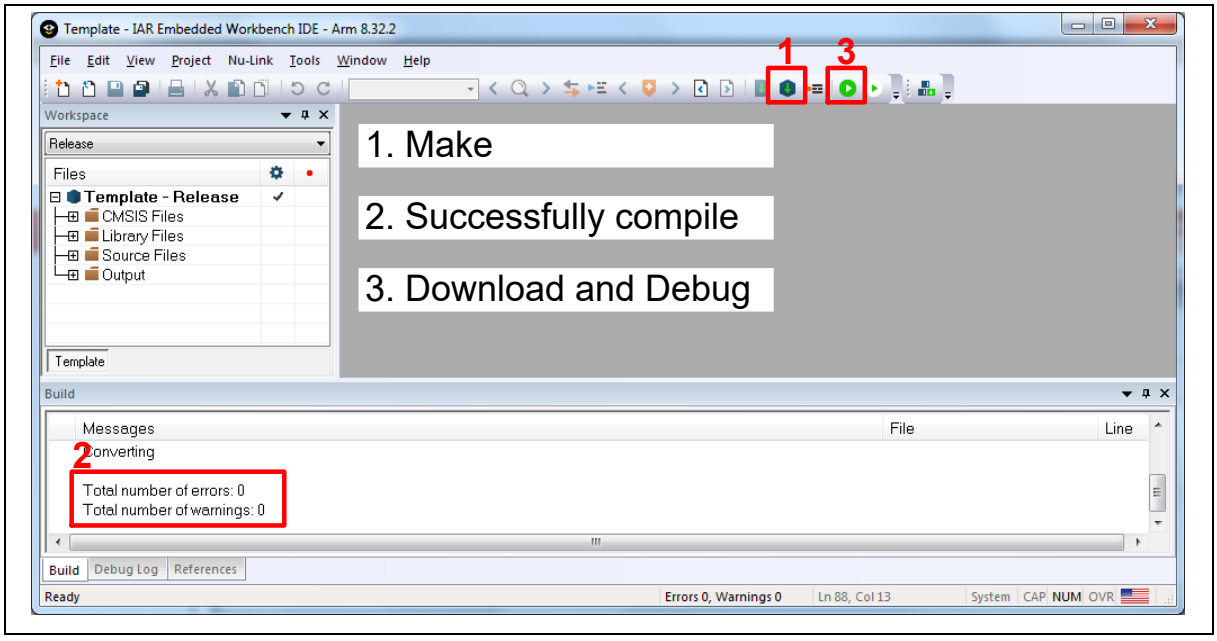


Figure 4-17 Compile and Download the Project

4. Figure 4-18 shows the debug mode under IAR EWARN. Click "**Go**" and the debug message will be printed out as shown in Figure 4-19. User can debug the project under debug mode by checking source code, assembly language, peripherals' registers, and setting breakpoint, step run, value monitor, etc.

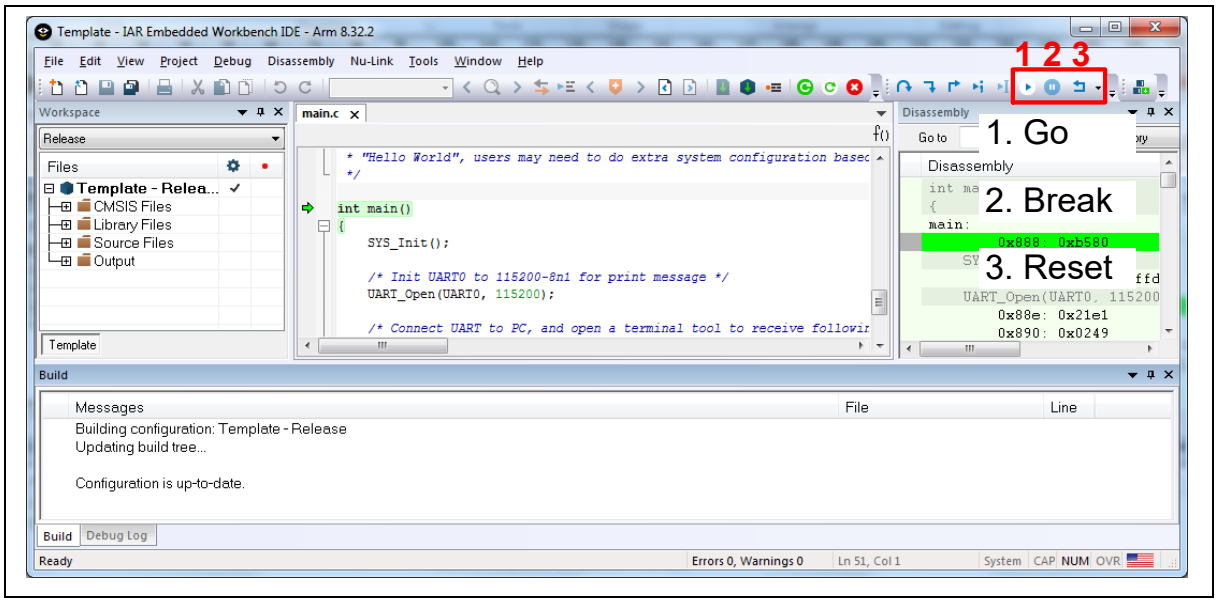


Figure 4-18 IAR EWARM Debug Mode

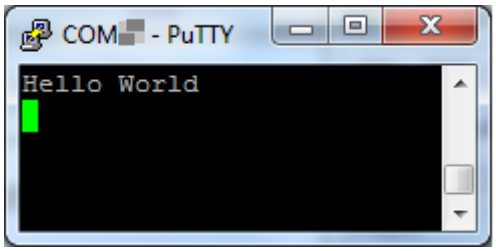


Figure 4-19 Debug Message on Serial Port Terminal Windows

4.6.3 Visual Studio Code

This section provides steps to beginners on how to run a project by using Visual Studio Code.

1. Double-click “Visual Studio Code.exe" to open the toolchain.
2. Import the “Template” project by following the steps presented in Figure 4-20.

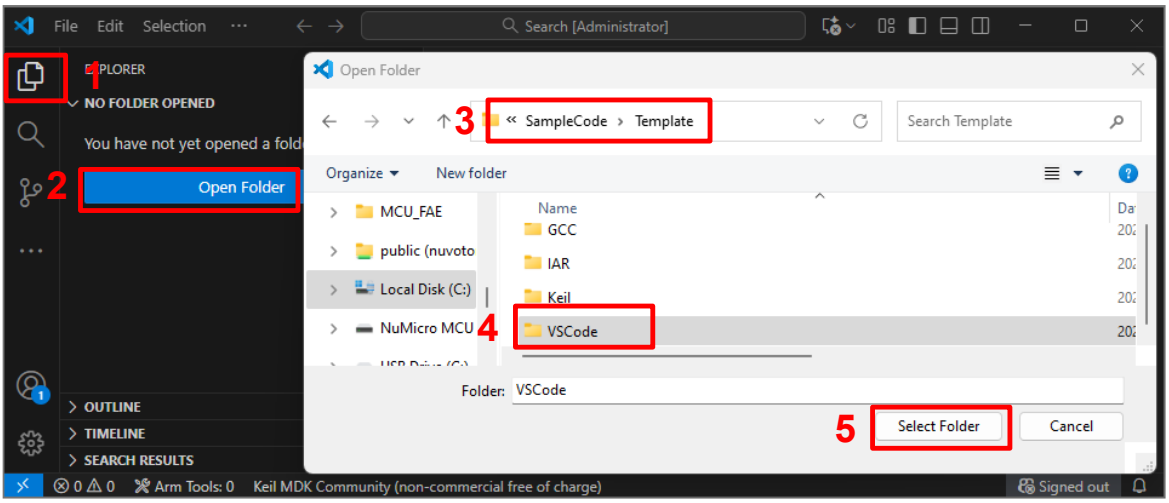


Figure 4-20 Import the Project in Visual Studio Code

3. Click the “**CMSIS**” button and build the project by following the steps presented in Figure 4-21. When building the code for the first time, Visual Studio Code may require the installation of additional components or extensions. Simply follow the on-screen instructions provided by Visual Studio Code to complete the setup.

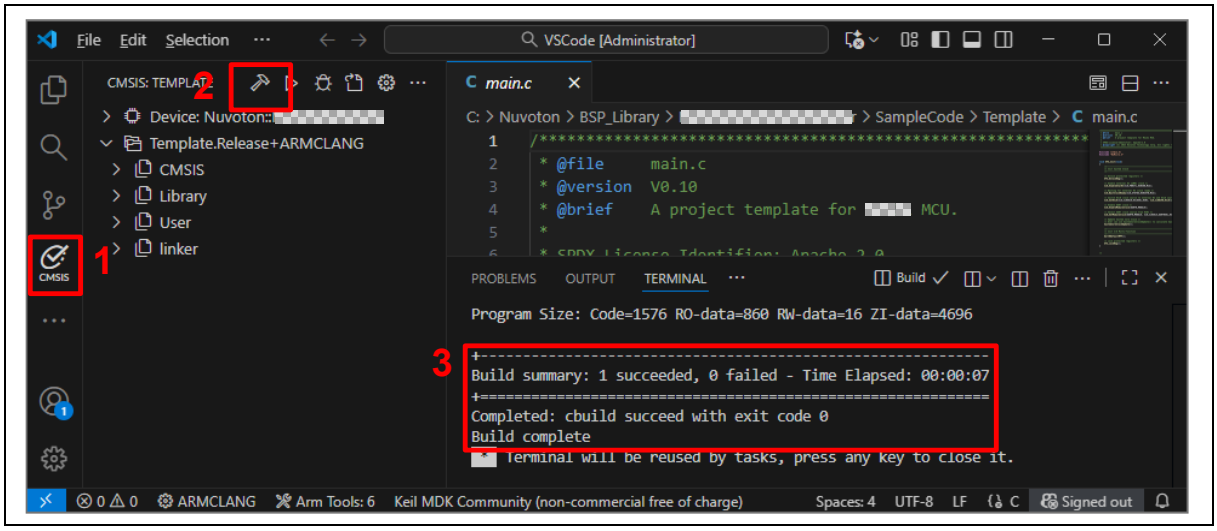


Figure 4-21 Build the Project in Visual Studio Code

4. After the project is built, click the "**Load & Run application**" to program the target board by following the steps illustrated in Figure 4-22. Users can also click "**Load & Debug application**" to program the target board and enter debug mode by following the steps illustrated in Figure 4-23.

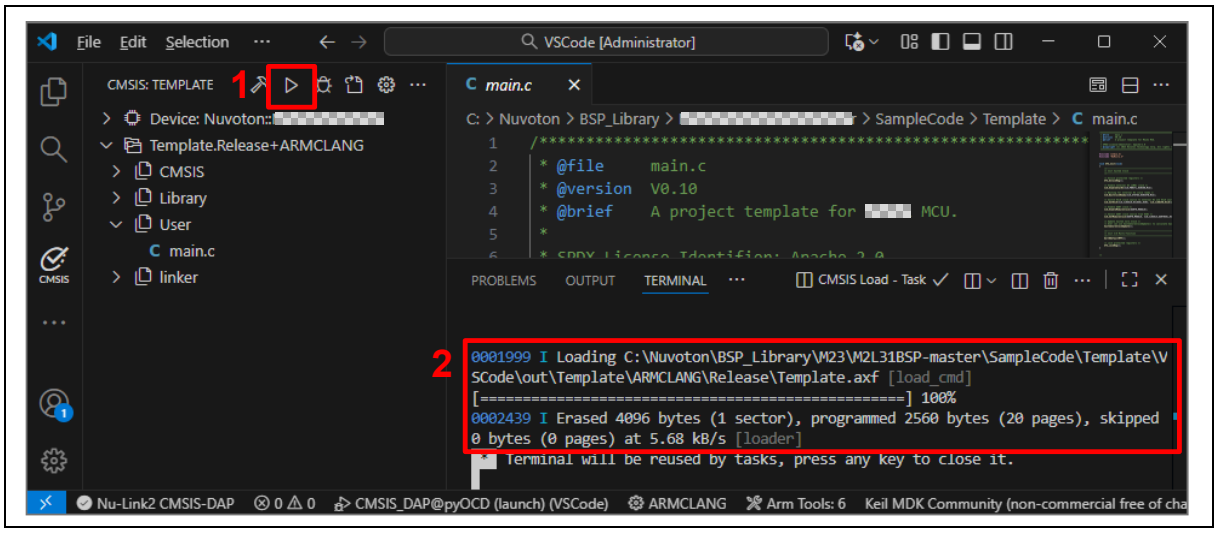


Figure 4-22 Load & Run the Project in Visual Studio Code

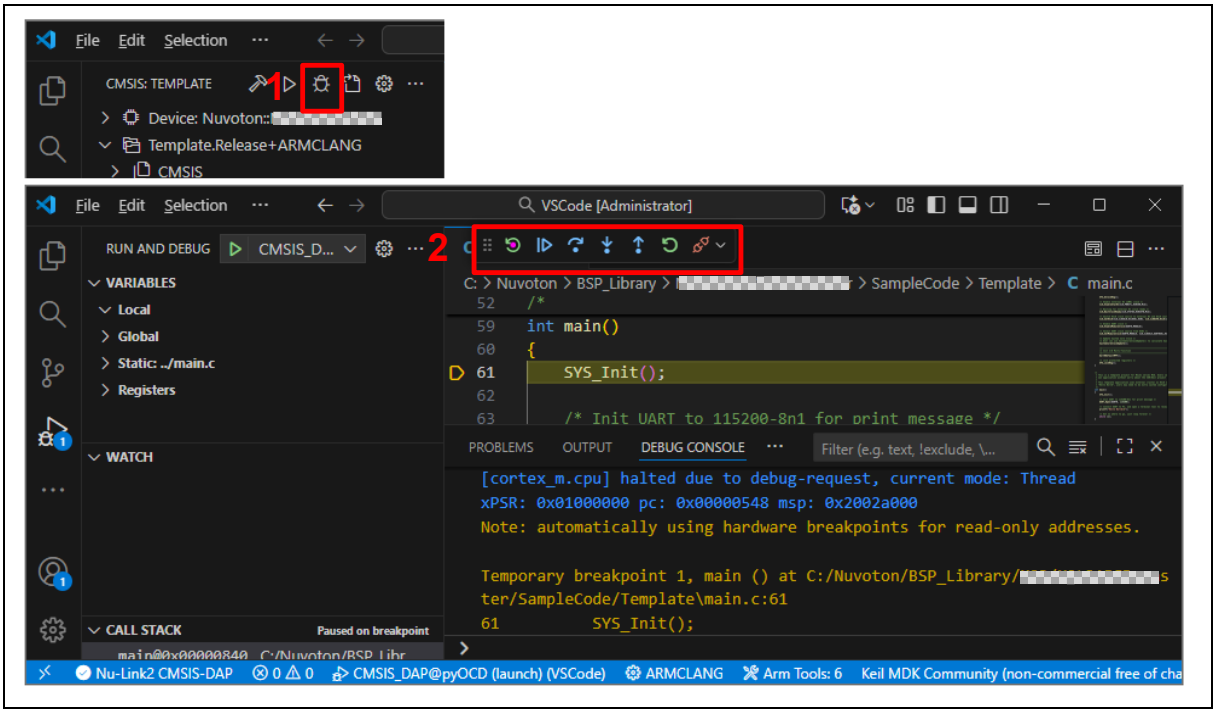


Figure 4-23 Enter Debug Mode in Visual Studio Code

5. User can print out the debug message in Visual Studio Code by following the steps illustrated in Figure 4-24 and Figure 4-25.

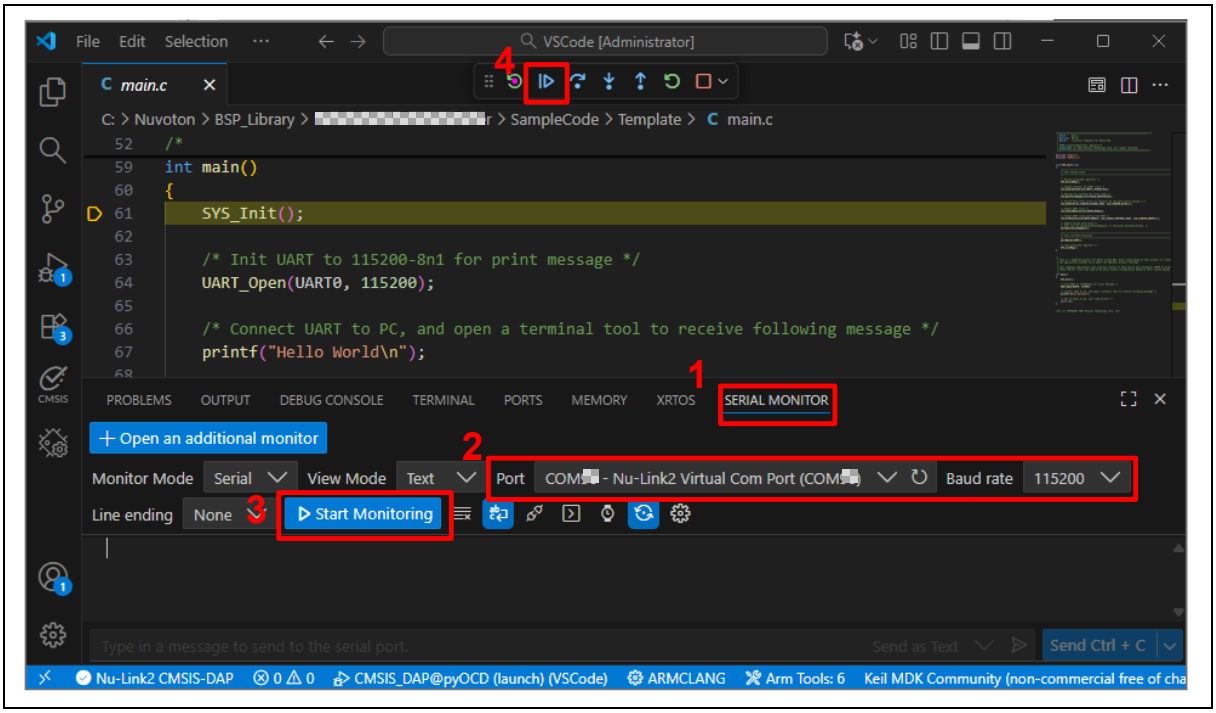


Figure 4-24 Setting Serial Monitor in Visual Studio Code

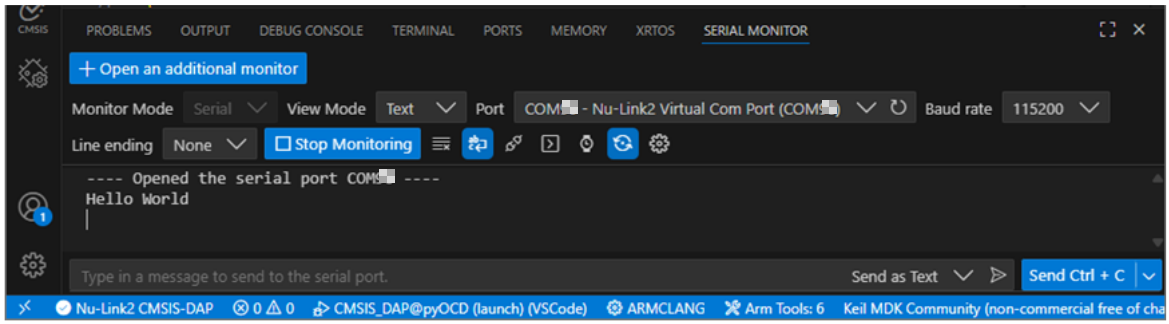


Figure 4-25 Debug Message in Serial Monitor

5 NUMAKER-M3333SG SCHEMATICS

5.1 Nu-Link2-Me

Figure 5-1 shows the Nu-Link2-Me circuit.

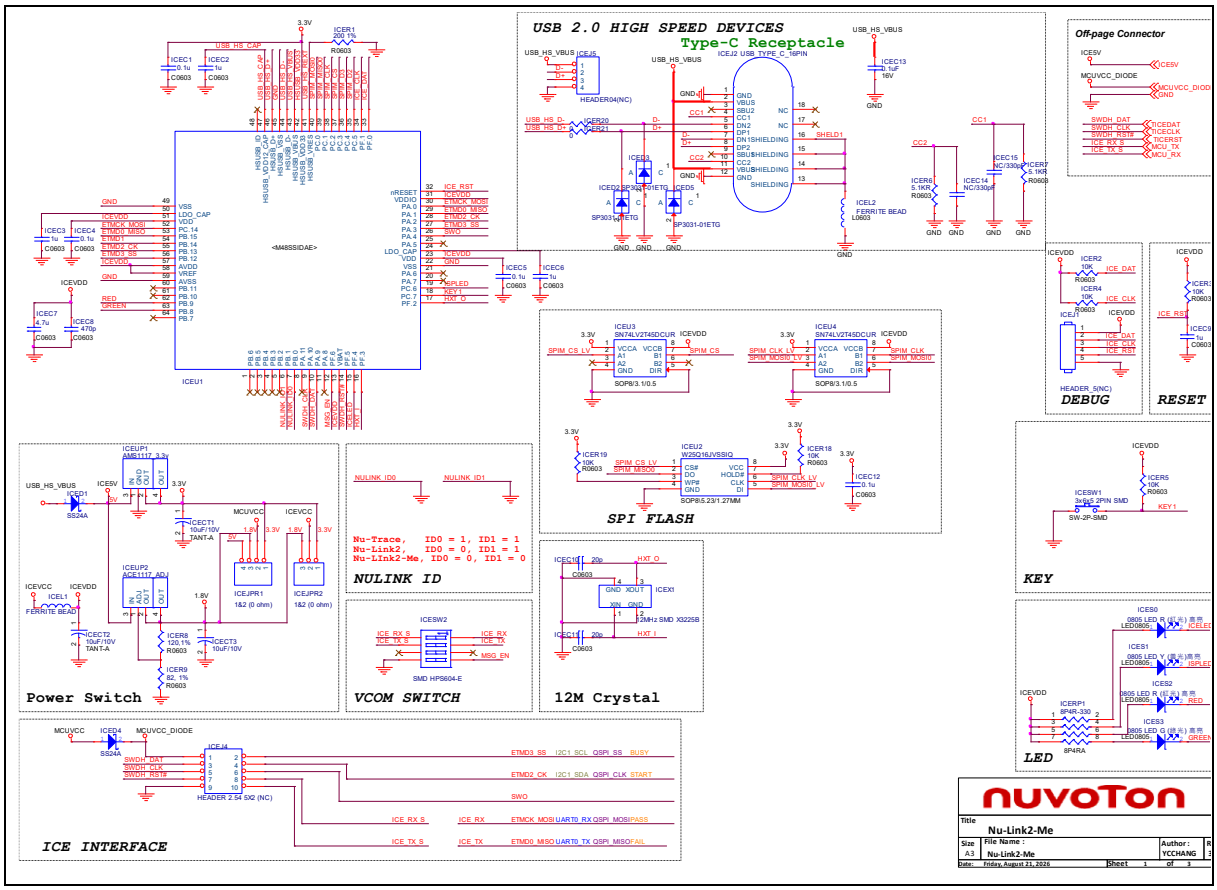


Figure 5-1 Nu-Link2-Me Circuit

5.2 M3333SG Target Board

Figure 5-2 shows the M3333SG target board circuit.

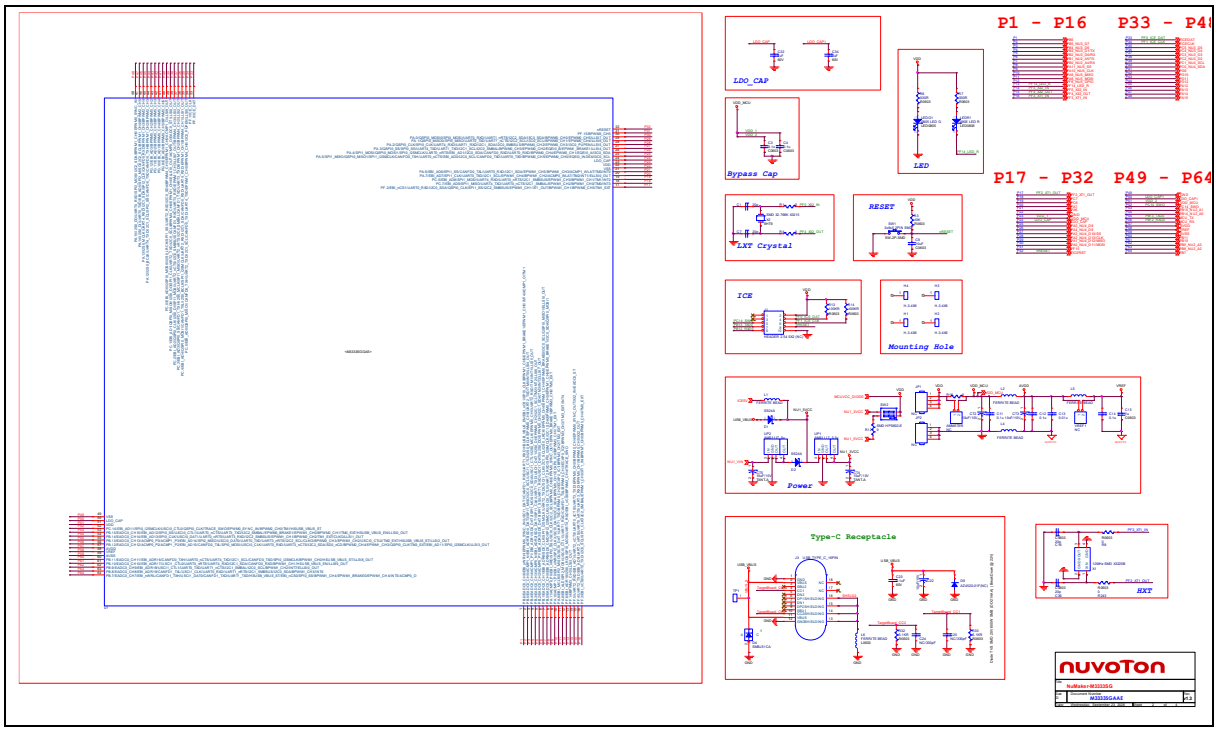


Figure 5-2 M3333SG Target Board Circuit

5.3 Extension Connectors

Figure 5-3 shows extension connectors of NuMaker-M3333SG.

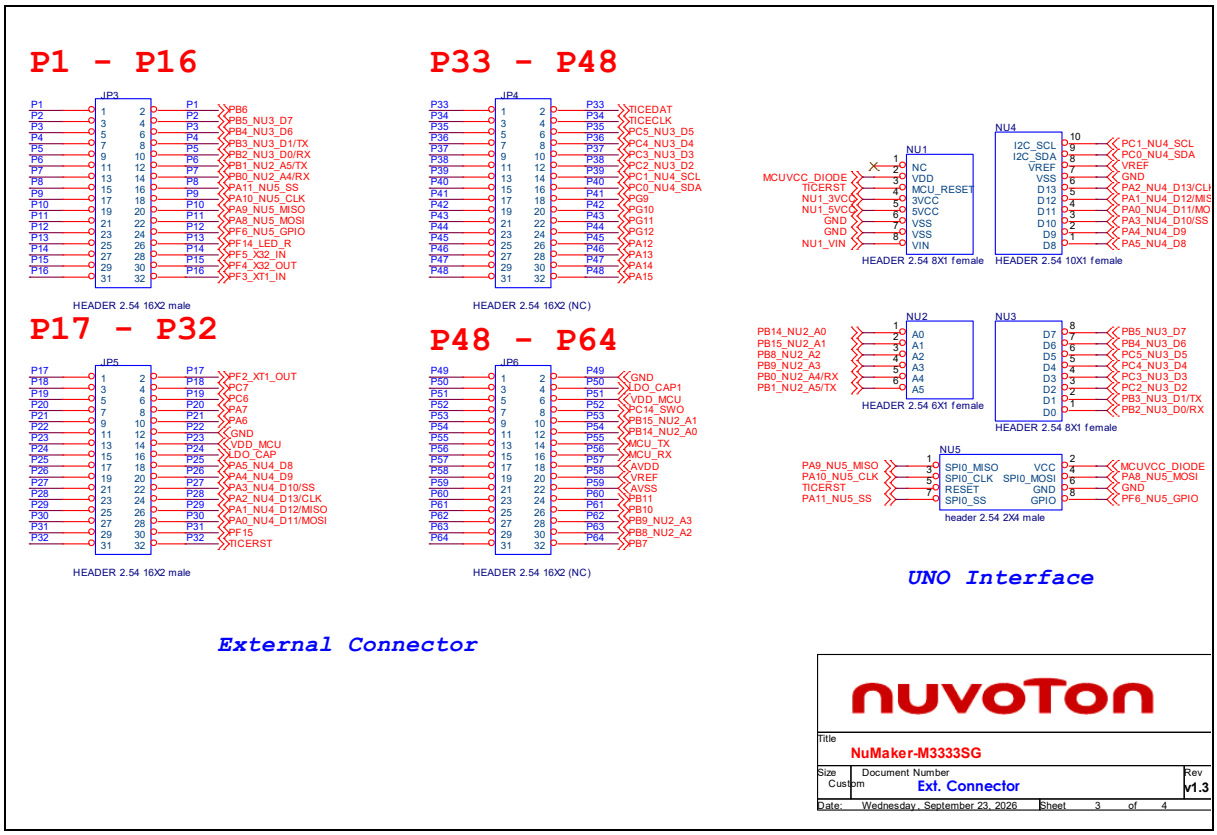


Figure 5-3 Extension Connectors Circuit

5.4 PCB Placement

Figure 5-4 and Figure 5-5 show the front and rear placement of NuMaker-M3333SG.

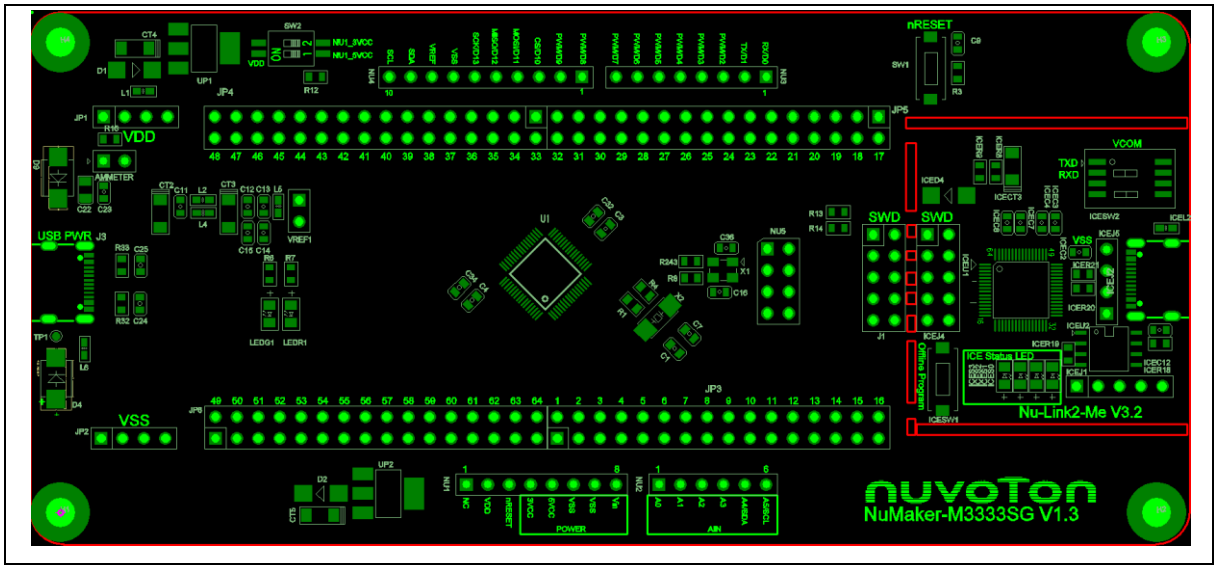


Figure 5-4 Front Placement

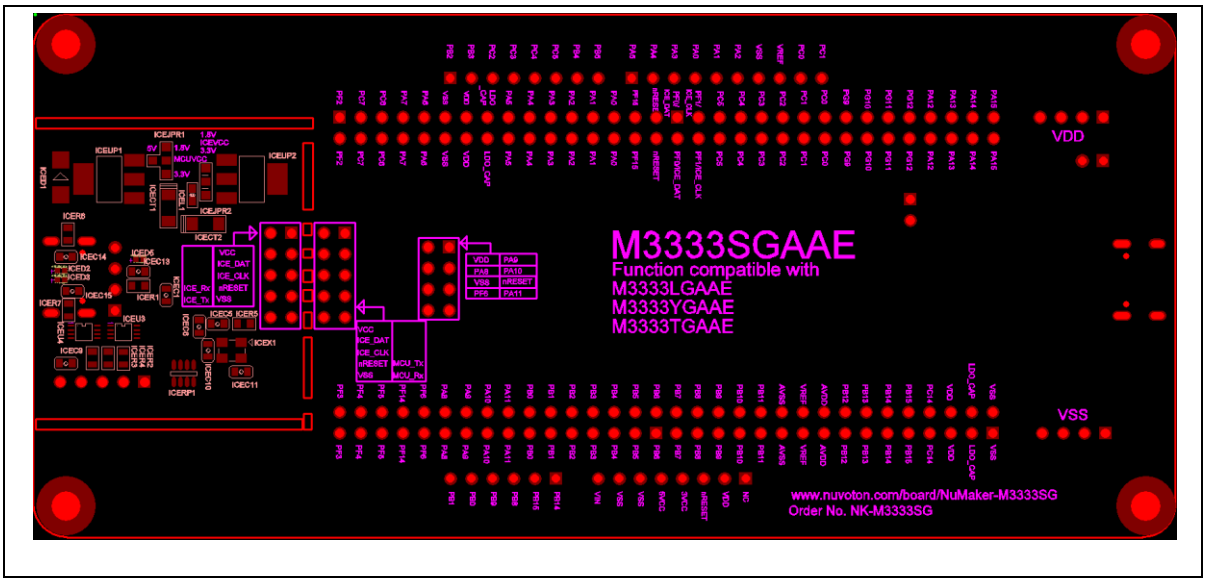


Figure 5-5 Rear Placement

6 REVISION HISTORY

Date	Revision	Description
2026.09.30	1.00	● Initial version.

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