Arm® Cortex®-M

32-bit Microcontroller

NuMaker-M263KI
User Manual
NuMicro® M261/M262/M263 Series

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

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1 OVERVIEW

This user manual is aimed to give users a fast introduction to the use of NuMaker-M263KI board.

The NuMaker-M263KI consists of two parts, a M263 platform and an on-board Nu-Link2-Me debugger and programmer. The NuMaker-M263KI allows users to quickly develop and easily program and debug application.

The NuMaker-M263KI offers M263KIAAE full pins extension connectors, Arduino UNO compatible extension connectors and diversified power supply option. It is an easy-to-develop platform for user to expand the functionality and build the applications. The NuMaker-M263KI also provides an ammeter connector, allows user to monitor the microcontroller's power consumption during development.

The Nu-Link2-Me is a debugger and programmer that supports on-line programming and debugging through SWD interface. The on-board 16 Mbit SPI Flash allows it to off-line program the target microcontroller. The Nu-Link2-Me provides virtual COM port (VCOM) function to print out messages on PC. The Nu-Link2-Me can be separated from NuMaker-M263KI, allowing user to use it as a mass production programming tool.

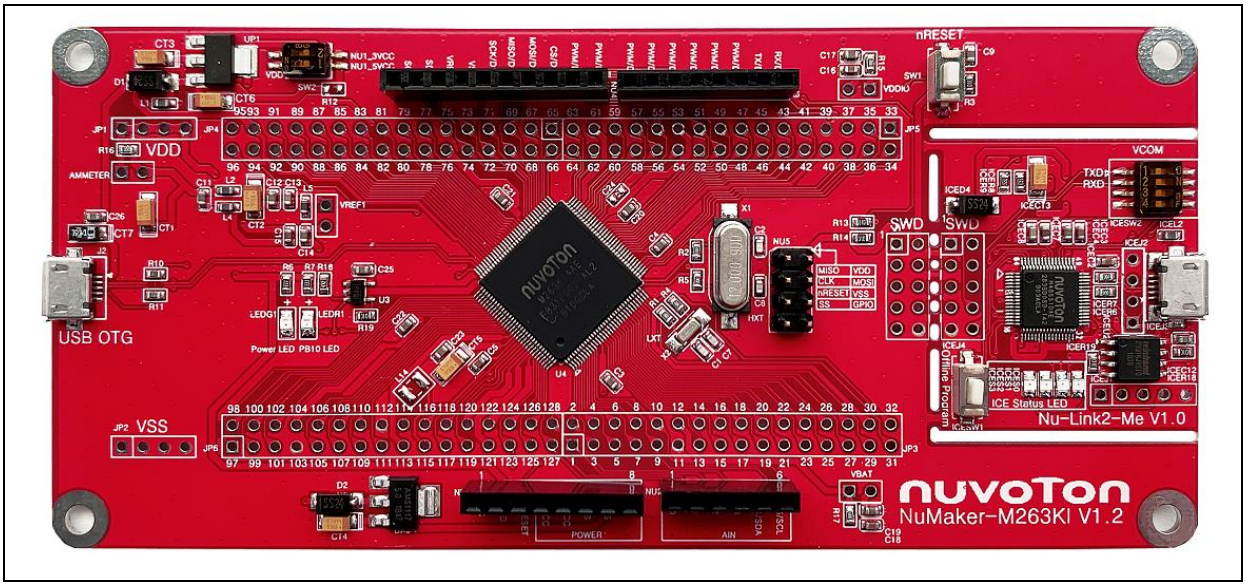

Figure 1-1 NuMaker-M263KI Board

1.1 NuMaker-M263KI Features

- NuMicro® M263KIAAE used as main microcontroller with functions downward compatible with:
  - M261ZIAAE
  - M261SIAAE
  - M261KIAAE
  - M262ZIAAE
  - M262SIAAE
  - M262KIAAE
  - M263ZIAAE
  - M263SIAAE
  - M263KIAAE

- M263KIAAE full pins extension connectors
- Arduino UNO compatible extension connectors
- Ammeter connector for measuring the microcontroller's power consumption
- Fixable board power supply:
  - External V_{DD} power connector
  - Arduino UNO compatible extension connector VIN
  - USB OTG connector on M263 platform
  - ICE USB connector on Nu-Link2-Me
- On-board Nu-Link2-Me debugger and programmer:
  - Debug through SWD interface
  - On-line/off-line programming
  - Virtual COM port function

2 NUMAKER-M263KI OVERVIEW

2.1 Front View

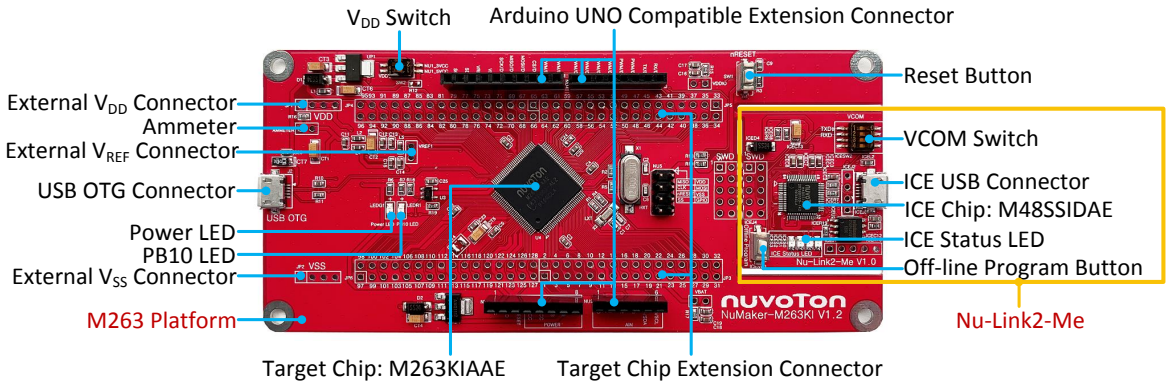

Figure 2-1 Front View of NuMaker-M263KI

Figure 2-1 shows the main components and connectors from the front side of NuMaker-M263KI. The following lists components and connectors from the front view:

- Target Chip: M263KIAAE (U4)
- USB OTG Connector (J2)
- Arduino UNO Compatible Extension Connectors (NU1, NU2, NU3, NU4)
- M263KIAAE Extension Connectors (JP3, JP4, JP5 and JP6)
- External V_{DD} Power Connector (JP1)
- External V_{SS} Power Connector (JP2)
- External V_{REF} Connector (VREF1)
- VDD Switch (SW2)
- Ammeter Connector (AMMETER)
- Reset Button (SW1)
- Power LED and PB10 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)

2.2 Rear View

Figure 2-2 shows the main components and connectors from the rear side of NuMaker-M263KI.

The following lists components and connectors from the rear view:

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

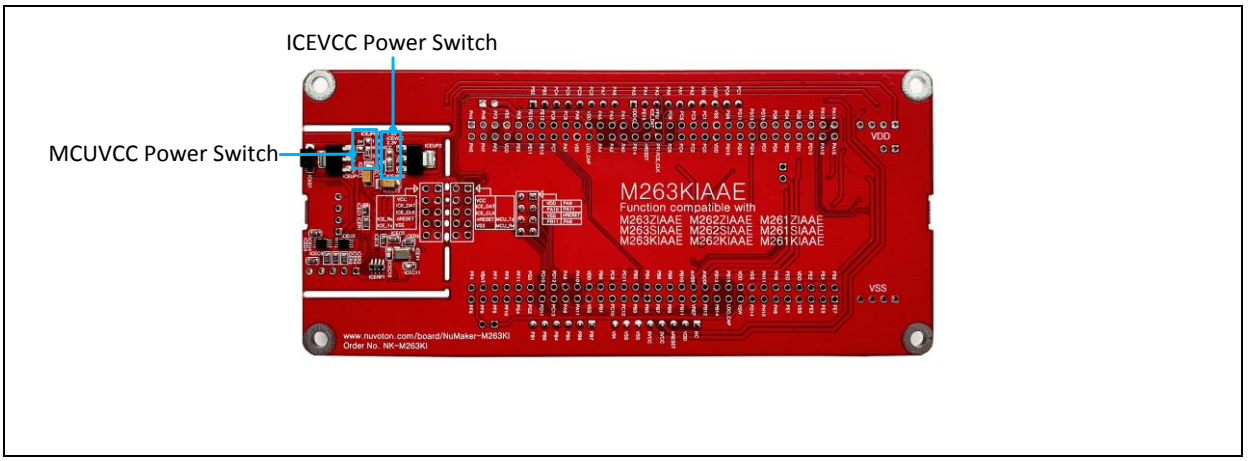

Figure 2-2 Rear View of NuMaker-M263KI

2.3 Arduino UNO Compatible Extension Connectors

Figure 2-3 shows the Arduino UNO compatible extension connectors.

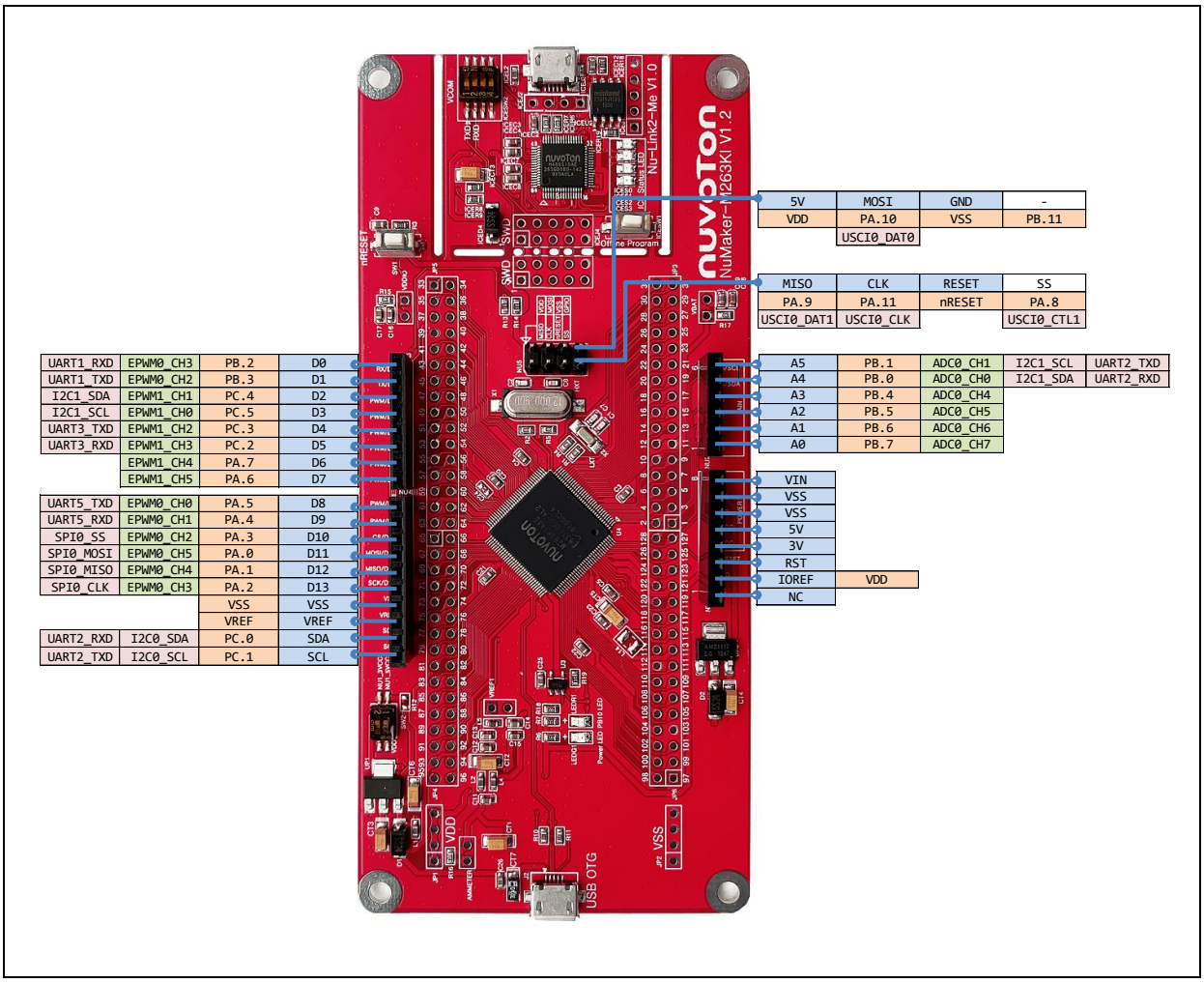

Figure 2-3 Arduino UNO Compatible Extension Connectors

Header		NuMaker-M263KI		Header		NuMaker-M263KI	
		Compatible to Arduino UNO	GPIO Pin of M263KIAAE			Compatible to Arduino UNO	GPIO Pin of M263KIAAE
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_{DD}
	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 2-1 Arduino UNO Extension Connectors and M263KIAAE Mapping GPIO List

2.4 Pin Assignment for Extension Connectors

The NuMaker-M263KI provides the M263KIAAE target chip onboard and full pins extension connectors (JP3, JP4, JP5 and JP6). Figure 2-4 shows the M263KIAAE extension connectors.

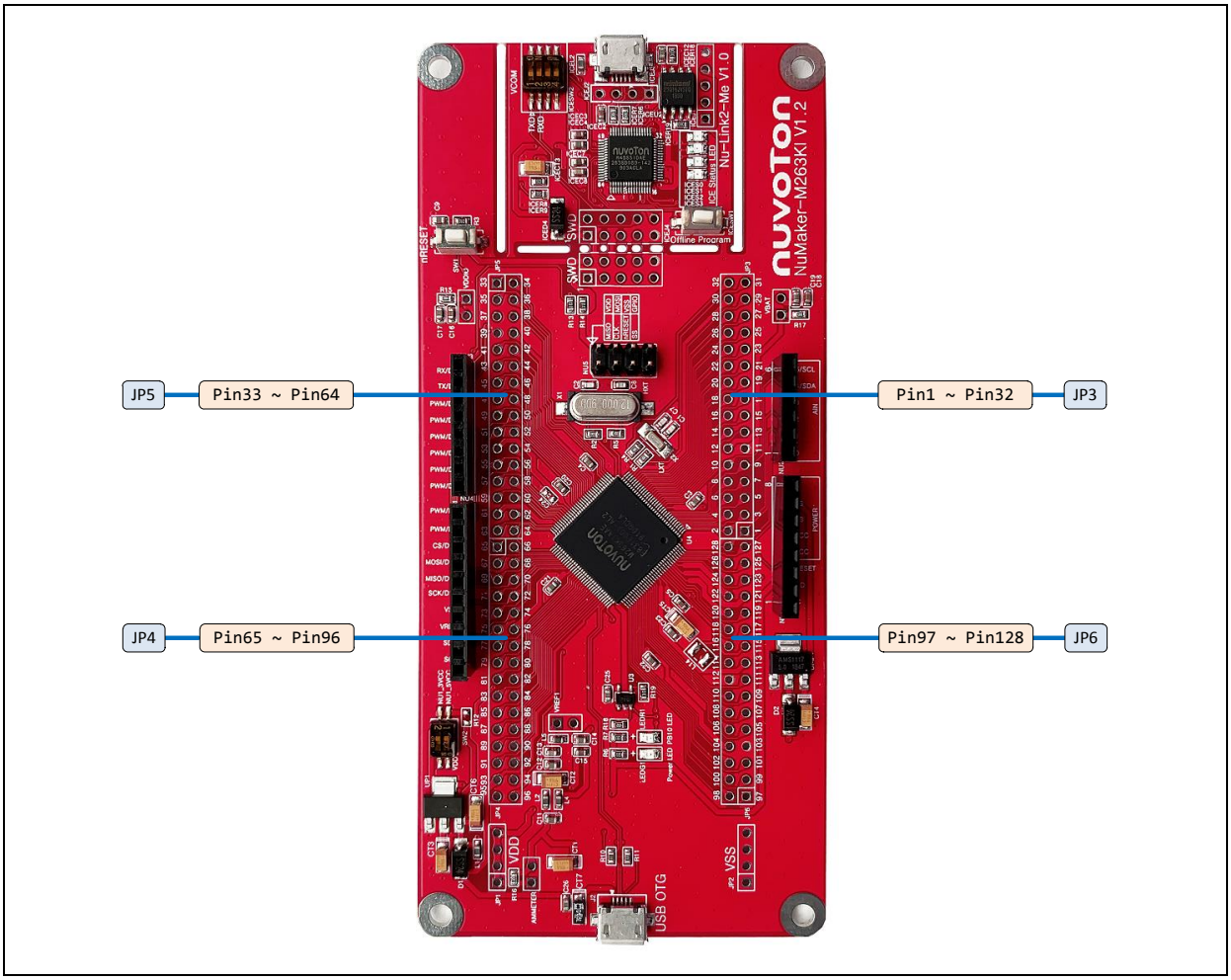

Figure 2-4 M263KIAAE Extension Connectors

Header		M263KIAAE	
		Pin No.	Function
JP3	JP3.1	1	PB.5/EADC0_CH5/ACMP1_N/EBI_ADR0/SD0_DAT3/SPI1_MISO/I2C0_SCL/UART5_TXD/USCI1_CTL0/SC0_CLK/I2S0_BCLK/EPWM0_CH0/TM0/INT0
	JP3.2	2	PB.4/EADC0_CH4/ACMP1_P1/EBI_ADR1/SD0_DAT2/SPI1_MOSI/I2C0_SDA/UART5_RXD/USCI1_CTL1/SC0_DAT/I2S0_MCLK/EPWM0_CH1/TM1/INT1
	JP3.3	3	PB.3/EADC0_CH3/ACMP0_N/EBI_ADR2/SD0_DAT1/SPI1_CLK/UART1_TXD/UART5_nRTS/USCI1_DAT1/SC0_RST/I2S0_DI/EPWM0_CH2/TM2/INT2
	JP3.4	4	PB.2/EADC0_CH2/ACMP0_P1/EBI_ADR3/SD0_DAT0/SPI1_SS/UART1_RXD/UART5_nCTS/USCI1_DAT0/SC0_PWR/I2S0_DO/EPWM0_CH3/TM3/INT3
	JP3.5	5	PC.12/EBI_ADR4/UART0_TXD/I2C0_SCL/SPI3_MISO/SC0_nCD/ECAP1_IC2/EPWM1_CH0/ACMP0_O
	JP3.6	6	PC.11/EBI_ADR5/UART0_RXD/I2C0_SDA/SPI3_MOSI/ECAP1_IC1/EPWM1_CH1/ACMP1_O
	JP3.7	7	PC.10/EBI_ADR6/SPI3_CLK/UART3_TXD/ECAP1_IC0/EPWM1_CH2
	JP3.8	8	PC.9/EBI_ADR7/SPI3_SS/UART3_RXD/EPWM1_CH3
	JP3.9	9	PB.1/EADC0_CH1/EBI_ADR8/SD0_CLK/SPI1_I2SMCLK/SPI3_I2SMCLK/UART2_TXD/USCI1_CLK/I2C1_SCL/I2S0_LRCK/EPWM0_CH4/EPWM1_CH4/EPWM0_BRAKE0
	JP3.10	10	PB.0/EADC0_CH0/EBI_ADR9/SD0_CMD/UART2_RXD/SPI0_I2SMCLK/I2C1_SDA/EPWM0_CH5/EPWM1_CH5/EPWM0_BRAKE1
	JP3.11	11	V_{SS}
	JP3.12	12	V_{DD}
	JP3.13	13	PA.11/ACMP0_P0/EBI_nRD/SC2_PWR/SPI2_SS/USCI0_CLK/I2C2_SCL/BPWM0_CH0/EPWM0_SYNC_OUT/TM0_EXT/DAC1_ST
	JP3.14	14	PA.10/ACMP1_P0/EBI_nWR/SC2_RST/SPI2_CLK/USCI0_DAT0/I2C2_SDA/BPWM0_CH1/QEI1_INDEX/ECAP0_IC0/TM1_EXT/DAC0_ST
	JP3.15	15	PA.9/EBI_MCLK/SC2_DAT/SPI2_MISO/USCI0_DAT1/UART1_TXD/BPWM0_CH2/QEI1_A/ECAP0_IC1/TM2_EXT
	JP3.16	16	PA.8/EBI_ALE/SC2_CLK/SPI2_MOSI/USCI0_CTL1/UART1_RXD/BPWM0_CH3/QEI1_B/ECAP0_IC2/TM3_EXT/INT4
	JP3.17	17	PC.13/EBI_ADR10/SC2_nCD/SPI2_I2SMCLK/USCI0_CTL0/UART2_TXD/BPWM0_CH4/CLKO/EADC0_ST
	JP3.18	18	PD.12/EBI_nCS0/UART2_RXD/BPWM0_CH5/QEI0_INDEX/CLKO/EADC0_ST/INT5
	JP3.19	19	PD.11/EBI_nCS1/UART1_TXD/CAN0_TXD/QEI0_A/INT6
	JP3.20	20	PD.10/EBI_nCS2/UART1_RXD/CAN0_RXD/QEI0_B/INT7
	JP3.21	21	PG.2/EBI_ADR11/SPI2_SS/I2C0_SMBAL/I2C1_SCL/TM0
	JP3.22	22	PG.3/EBI_ADR12/SPI2_CLK/I2C0_SMBSUS/I2C1_SDA/TM1
	JP3.23	23	PG.4/EBI_ADR13/SPI2_MISO/TM2
	JP3.24	24	PF.11/EBI_ADR14/SPI2_MOSI/TAMPER5/TM3
	JP3.25	25	PF.10/EBI_ADR15/SC0_nCD/I2S0_BCLK/SPI0_I2SMCLK/TAMPER4
	JP3.26	26	PF.9/EBI_ADR16/SC0_PWR/I2S0_MCLK/SPI0_SS/TAMPER3
	JP3.27	27	PF.8/EBI_ADR17/SC0_RST/I2S0_DI/SPI0_CLK/TAMPER2
	JP3.28	28	PF.7/EBI_ADR18/SC0_DAT/I2S0_DO/SPI0_MISO/UART4_TXD/TAMPER1
	JP3.29	29	PF.6/EBI_ADR19/SC0_CLK/I2S0_LRCK/SPI0_MOSI/UART4_RXD/EBI_nCS0/TAMPER0
	JP3.30	30	V_{BAT}
	JP3.31	31	PF.5/UART2_RXD/UART2_nCTS/BPWM0_CH4/EPWM0_SYNC_OUT/X32_IN/EADC0_ST
	JP3.32	32	PF.4/UART2_TXD/UART2_nRTS/BPWM0_CH5/X32_OUT

JP5	JP5.1	33	PH.4/EBI_ADR3/SPI1_MISO
	JP5.2	34	PH.5/EBI_ADR2/SPI1_MOSI
	JP5.3	35	PH.6/EBI_ADR1/SPI1_CLK
	JP5.4	36	PH.7/EBI_ADR0/SPI1_SS
	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/I2S0_BCLK/SPI2_CLK/USCI1_CTL1/UART2_TXD/EPWM0_CH0/EPWM0_BRAKE0/ECAP0_IC0/TRACE_DATA3
	JP5.10	42	PE.9/EBI_ADR11/I2S0_MCLK/SPI2_MISO/USCI1_CTL0/UART2_RXD/EPWM0_CH1/EPWM0_BRAKE1/ECAP0_IC1/TRACE_DATA2
	JP5.11	43	PE.10/EBI_ADR12/I2S0_DI/SPI2_MOSI/USCI1_DAT0/UART3_TXD/EPWM0_CH2/EPWM1_BRAKE0/ECAP0_IC2/TRACE_DATA1
	JP5.12	44	PE.11/EBI_ADR13/I2S0_DO/SPI2_SS/USCI1_DAT1/UART3_RXD/UART1_nCTS/EPWM0_CH3/EPWM1_BRAKE1/ECAP1_IC2/TRACE_DATA0
	JP5.13	45	PE.12/EBI_ADR14/I2S0_LRCK/SPI2_I2SMCLK/USCI1_CLK/UART1_nRTS/EPWM0_CH4/ECAP1_IC1/TRACE_CLK
	JP5.14	46	PE.13/EBI_ADR15/I2C0_SCL/UART4_nRTS/UART1_TXD/EPWM0_CH5/EPWM1_CH0/BPWM1_CH5/ECAP1_IC0
	JP5.15	47	PC.8/EBI_ADR16/I2C0_SDA/UART4_nCTS/UART1_RXD/EPWM1_CH1/BPWM1_CH4
	JP5.16	48	PC.7/EBI_AD9/SPI1_MISO/UART4_TXD/SC2_PWR/UART0_nCTS/I2C1_SMBAL/EPWM1_CH2/BPWM1_CH0/TM0/INT3
	JP5.17	49	PC.6/EBI_AD8/SPI1_MOSI/UART4_RXD/SC2_RST/UART0_nRTS/I2C1_SMBSUS/EPWM1_CH3/BPWM1_CH1/TM1/INT2
	JP5.18	50	PA.7/EBI_AD7/SPI1_CLK/SC2_DAT/UART0_TXD/I2C1_SCL/EPWM1_CH4/BPWM1_CH2/ACMP0_WLAT/TM2/INT1
	JP5.19	51	PA.6/EBI_AD6/SPI1_SS/SC2_CLK/UART0_RXD/I2C1_SDA/EPWM1_CH5/BPWM1_CH3/ACMP1_WLAT/TM3/INT0
	JP5.20	52	V_{SS}
	JP5.21	53	V_{DD}
	JP5.22	54	LDO_CAP
	JP5.23	55	PA.5/QSPI0_MISO1/SPI1_I2SMCLK/SC2_nCD/UART0_nCTS/UART5_TXD/I2C0_SCL/CAN0_TXD/BPWM0_CH5/EPWM0_CH0/QEI0_INDEX
	JP5.24	56	PA.4/QSPI0_MOSI1/SPI0_I2SMCLK/SC0_nCD/UART0_nRTS/UART5_RXD/I2C0_SDA/CAN0_RXD/BPWM0_CH4/EPWM0_CH1/QEI0_A
	JP5.25	57	PA.3/QSPI0_SS/SPI0_SS/SC0_PWR/UART4_TXD/UART1_TXD/I2C1_SCL/BPWM0_CH3/EPWM0_CH2/QEI0_B
	JP5.26	58	PA.2/QSPI0_CLK/SPI0_CLK/SC0_RST/UART4_RXD/UART1_RXD/I2C1_SDA/BPWM0_CH2/EPWM0_CH3
	JP5.27	59	PA.1/QSPI0_MISO0/SPI0_MISO/SC0_DAT/UART0_TXD/UART1_nCTS/I2C2_SCL/BPWM0_CH1/EPWM0_CH4/DAC1_ST
	JP5.28	60	PA.0/QSPI0_MOSI0/SPI0_MOSI/SC0_CLK/UART0_RXD/UART1_nRTS/I2C2_SDA/BPWM0_CH0/EPWM0_CH5/DAC0_ST
	JP5.29	61	V_{DDIO}
	JP5.30	62	PE.14/EBI_AD8/UART2_TXD/CAN0_TXD
	JP5.31	63	PE.15/EBI_AD9/UART2_RXD/CAN0_RXD
	JP5.32	64	nRESET
JP4	JP4.1	65	PF.0/UART1_TXD/I2C1_SCL/BPWM1_CH0/ICE_DAT

	JP4.2	66	PF.1/UART1_RXD/I2C1_SDA/BPWM1_CH1/ICE_CLK
	JP4.3	67	PD.9/EBI_AD7/I2C2_SCL/UART2_nCTS
	JP4.4	68	PD.8/EBI_AD6/I2C2_SDA/UART2_nRTS
	JP4.5	69	PC.5/EBI_AD5/QSPI0_MISO1/UART2_TXD/I2C1_SCL/CAN0_TXD/UART4_TXD/EPWM1_CH0
	JP4.6	70	PC.4/EBI_AD4/QSPI0_MOSI1/SC1_nCD/I2S0_BCLK/SPI1_I2SMCLK/UART2_RXD/I2C1_SDA/CAN0_RXD/UART4_RXD/EPWM1_CH1
	JP4.7	71	PC.3/EBI_AD3/QSPI0_SS/SC1_PWR/I2S0_MCLK/SPI1_MISO/UART2_nRTS/I2C0_SMBAL/UART3_TXD/EPWM1_CH2
	JP4.8	72	PC.2/EBI_AD2/QSPI0_CLK/SC1_RST/I2S0_DI/SPI1_MOSI/UART2_nCTS/I2C0_SMBSUS/UART3_RXD/EPWM1_CH3
	JP4.9	73	PC.1/EBI_AD1/QSPI0_MISO0/SC1_DAT/I2S0_DO/SPI1_CLK/UART2_TXD/I2C0_SCL/EPWM1_CH4/ACMP0_O
	JP4.10	74	PC.0/EBI_AD0/QSPI0_MOSI0/SC1_CLK/I2S0_LRCK/SPI1_SS/UART2_RXD/I2C0_SDA/EPWM1_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/BPWM0_CH3
	JP4.16	80	PG.12/EBI_AD3/BPWM0_CH2
	JP4.17	81	PG.13/EBI_AD4/BPWM0_CH1
	JP4.18	82	PG.14/EBI_AD5/BPWM0_CH0
	JP4.19	83	PG.15/CLKO/EADC0_ST
	JP4.20	84	PD.7/UART1_TXD/I2C0_SCL/SPI1_MISO/USCI1_CLK/SC1_PWR
	JP4.21	85	PD.6/UART1_RXD/I2C0_SDA/SPI1_MOSI/USCI1_DAT1/SC1_RST
	JP4.22	86	PD.5/I2C1_SCL/SPI1_CLK/USCI1_DAT0/SC1_DAT
	JP4.23	87	PD.4/USCI0_CTL0/I2C1_SDA/SPI1_SS/USCI1_CTL1/SC1_CLK/USB_VBUS_ST
	JP4.24	88	PD.3/EBI_AD10/USCI0_CTL1/SPI0_SS/UART3_nRTS/USCI1_CTL0/SC2_PWR/SC1_nCD/UART0_TXD
	JP4.25	89	PD.2/EBI_AD11/USCI0_DAT1/SPI0_CLK/UART3_nCTS/SC2_RST/UART0_RXD
	JP4.26	90	PD.1/EBI_AD12/USCI0_DAT0/SPI0_MISO/UART3_TXD/I2C2_SCL/SC2_DAT
	JP4.27	91	PD.0/EBI_AD13/USCI0_CLK/SPI0_MOSI/UART3_RXD/I2C2_SDA/SC2_CLK/TM2
	JP4.28	92	PD.13/EBI_AD10/SD0_nCD/SPI0_I2SMCLK/SPI1_I2SMCLK/SC2_nCD
	JP4.29	93	PA.12/I2S0_BCLK/UART4_TXD/I2C1_SCL/SPI2_SS/CAN0_TXD/SC2_PWR/BPWM1_CH2/QEI1_INDEX/USB_VBUS
	JP4.30	94	PA.13/I2S0_MCLK/UART4_RXD/I2C1_SDA/SPI2_CLK/CAN0_RXD/SC2_RST/BPWM1_CH3/QEI1_A/USB_D-
	JP4.31	95	PA.14/I2S0_DI/UART0_TXD/SPI2_MISO/I2C2_SCL/SC2_DAT/BPWM1_CH4/QEI1_B/USB_D+
	JP4.32	96	PA.15/I2S0_DO/UART0_RXD/SPI2_MOSI/I2C2_SDA/SC2_CLK/BPWM1_CH5/EPWM0_SYNC_IN/USB_OTG_ID
JP6	JP6.1	97	PE.7/SD0_CMD/UART5_TXD/QEI1_INDEX/EPWM0_CH0/BPWM0_CH5
	JP6.2	98	PE.6/SD0_CLK/SPI3_I2SMCLK/SC0_nCD/USCI0_CTL0/UART5_RXD/QEI1_A/EPWM0_CH1/BPWM0_CH4
	JP6.3	99	PE.5/EBI_nRD/SD0_DAT3/SPI3_SS/SC0_PWR/USCI0_CTL1/QEI1_B/EPWM0_CH2/BPWM0_CH3

	JP6.4	100	PE.4/EBI_nWR/SD0_DAT2/SPI3_CLK/SC0_RST/USCI0_DAT1/QEI0_INDEX/EPWM0_CH3/BPWM0_CH2
	JP6.5	101	PE.3/EBI_MCLK/SD0_DAT1/SPI3_MISO/SC0_DAT/USCI0_DAT0/QEI0_A/EPWM0_CH4/BPWM0_CH1
	JP6.6	102	PE.2/EBI_ALE/SD0_DAT0/SPI3_MOSI/SC0_CLK/USCI0_CLK/QEI0_B/EPWM0_CH5/BPWM0_CH0
	JP6.7	103	V_{SS}
	JP6.8	104	V_{DD}
	JP6.9	105	PE.1/EBI_AD10/QSPI0_MISO0/SC2_DAT/I2S0_BCLK/SPI1_MISO/UART3_TXD/I2C1_SCL/UART4_nCTS
	JP6.10	106	PE.0/EBI_AD11/QSPI0_MOSI0/SC2_CLK/I2S0_MCLK/SPI1_MOSI/UART3_RXD/I2C1_SDA/UART4_nRTS
	JP6.11	107	PH.8/EBI_AD12/QSPI0_CLK/SC2_PWR/I2S0_DI/SPI1_CLK/UART3_nRTS/I2C1_SMBAL/I2C2_SCL/UART1_TXD
	JP6.12	108	PH.9/EBI_AD13/QSPI0_SS/SC2_RST/I2S0_DO/SPI1_SS/UART3_nCTS/I2C1_SMBSUS/I2C2_SDA/UART1_RXD
	JP6.13	109	PH.10/EBI_AD14/QSPI0_MISO1/SC2_nCD/I2S0_LRCK/SPI1_I2SMCLK/UART4_TXD/UART0_TXD
	JP6.14	110	PH.11/EBI_AD15/QSPI0_MOSI1/UART4_RXD/UART0_RXD/EPWM0_CH5
	JP6.15	111	PD.14/EBI_nCS0/SPI3_I2SMCLK/SC1_nCD/USCI0_CTL0/SPI0_I2SMCLK/EPWM0_CH4
	JP6.16	112	V_{SS}
	JP6.17	113	V_{SW}
	JP6.18	114	V_{DD}
	JP6.19	115	LDO_CAP
	JP6.20	116	PB.15/EADC0_CH15/EBI_AD12/SC1_PWR/SPI0_SS/USCI0_CTL1/UART0_nCTS/UART3_TXD/I2C2_SMBAL/EPWM1_CH0/TM0_EXT/USB_VBUS_EN
	JP6.21	117	PB.14/EADC0_CH14/EBI_AD13/SC1_RST/SPI0_CLK/USCI0_DAT1/UART0_nRTS/UART3_RXD/I2C2_SMBSUS/EPWM1_CH1/TM1_EXT/CLKO/USB_VBUS_ST
	JP6.22	118	PB.13/EADC0_CH13/DAC1_OUT/ACMP0_P3/ACMP1_P3/EBI_AD14/SC1_DAT/SPI0_MISO/USCI0_DAT0/UART0_TXD/UART3_nRTS/I2C2_SCL/EPWM1_CH2/TM2_EXT
	JP6.23	119	PB.12/EADC0_CH12/DAC0_OUT/ACMP0_P2/ACMP1_P2/EBI_AD15/SC1_CLK/SPI0_MOSI/USCI0_CLK/UART0_RXD/UART3_nCTS/I2C2_SDA/SD0_nCD/EPWM1_CH3/TM3_EXT
	JP6.24	120	AV_{DD}
	JP6.25	121	V_{REF}
	JP6.26	122	AV_{SS}
	JP6.27	123	PB.11/EADC0_CH11/EBI_ADR16/UART0_nCTS/UART4_TXD/I2C1_SCL/CAN0_TXD/SPI0_I2SMCLK/BPWM1_CH0/SPI3_CLK
	JP6.28	124	PB.10/EADC0_CH10/EBI_ADR17/USCI1_CTL0/UART0_nRTS/UART4_RXD/I2C1_SDA/CAN0_RXD/BPWM1_CH1/SPI3_SS
	JP6.29	125	PB.9/EADC0_CH9/EBI_ADR18/USCI1_CTL1/UART0_TXD/UART1_nCTS/I2C1_SMBAL/BPWM1_CH2/SPI3_MISO/INT7
	JP6.30	126	PB.8/EADC0_CH8/EBI_ADR19/USCI1_CLK/UART0_RXD/UART1_nRTS/I2C1_SMBSUS/BPWM1_CH3/SPI3_MOSI/INT6
	JP6.31	127	PB.7/EADC0_CH7/EBI_nWRL/USCI1_DAT0/UART1_TXD/EBI_nCS0/BPWM1_CH4/EPWM1_BRAKE0/EPWM1_CH4/INT5/USB_VBUS_ST/ACMP0_O
	JP6.32	128	PB.6/EADC0_CH6/EBI_nWRH/USCI1_DAT1/UART1_RXD/EBI_nCS1/BPWM1_CH5/EPWM1_BRAKE1/EPWM1_CH5/INT4/USB_VBUS_EN/ACMP1_O

Table 2-2 M263KIAAE Full-pin Extension Connectors and GPIO Function List

2.5 System Configuration

2.5.1 VIN Power Source

Table 2-3 presents the VIN power source.

Connector	Net Name in Schematic	Comment
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 NuMaker-M263KI.

Table 2-3 VIN Power Source

2.5.2 5 V Power Sources

Table 2-4 presents the 5 V power sources.

Connector	Net Name in Schematic	Comment
ICEJ3	USB_HS_VBUS	ICE USB connector supplies 5 V power from PC to M263 platform and Nu-Link2-Me.
J2	USB_VBUS	If target chip M263 acts as USB Device, USB connector on NuMaker-M263KI supplies 5 V power from PC to M263 platform and Nu-Link2-Me.
		If target chip M263 acts as USB Host, USB connector on NuMaker-M263KI supplies 5 V power from M263 platform to PC.
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:** M263 operating voltage range is from 1.8 V to 3.6 V. Do not switch SW2.1 (NU1 5VCC) to ON.

Table 2-4 5V Power Sources

2.5.3 3.3 V Power Sources

Table 2-5 presents the 3.3 V power sources.

Voltage Regulator	5V Source	Comment
ICEUP1	USB_HS_VBUS	ICEUP1 converts USB_HS_VBUS to 3.3 V and supplies 3.3V to M263 platform or ICE chip.
UP1	USB_VBUS	UP1 converts USB_VBUS to 3.3 V and supplies 3.3 V to M263 platform. **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 M263 platform.

		Note: SW2.2 (NU1 3VCC) should be switched to ON.

Table 2-5 3.3 V Power Sources

2.5.4 1.8V Power Sources

Table 2-6 presents the 1.8 V power source.

Voltage Regular	5V Source	Comment
ICEUP2	USB_HS_VBUS	ICEUP2 converts USB_HS_VBUS to 1.8V and supplies 1.8V to M263 platform or ICE chip.

Table 2-6 1.8V Power Sources

2.5.5 Power Connectors

Table 2-7 presents the power connectors.

Connector	Comment
JP1	V_{DD} (1.8 V ~ 3.6 V) connector on the NuMaker-M263KI.
JP2	V_{SS} connector on the NuMaker-M263KI.

Table 2-7 Power Connectors

2.5.6 USB Connectors

Table 2-8 presents the USB connectors.

Connector	Comment
ICEJ3	ICE USB connector on Nu-Link2-Me for power supply, debugging and programming from PC.
J2	USB OTG connector on NuMaker-M263KI for USB function.

Table 2-8 USB Connectors

2.5.7 Power Switches

Table 2-9 presents the power switches.

Switch	Comment
ICEJPR1	Configure the target chip operating voltage at 1.8 V / 3.3 V / 5 V.
ICEJPR2	Configure the ICE chip operating voltage at 1.8 V / 3.3 V.
SW2	Configure the target chip operating voltage at 3.3 V / 5 V.

Table 2-9 Power Switches

2.5.8 Power Supply Models

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

The external power supply source on Nu-Link2-Me is shown in Figure 2-5.

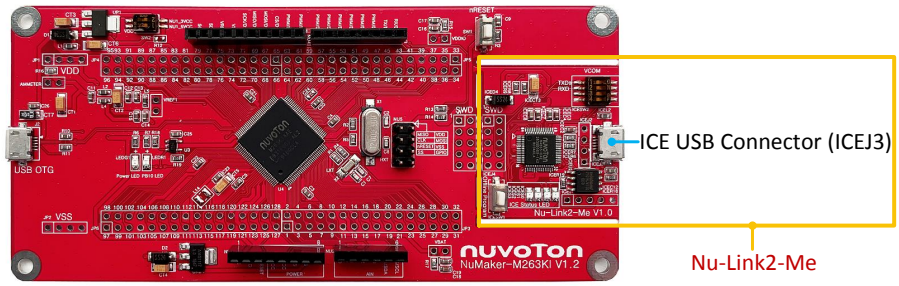

Figure 2-5 External Power Supply Sources on Nu-Link2-Me

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

1. Solder the resistor on ICEJPR1 (MCUVCC) depends on the target chip operating voltage.
2. Solder the resistor on ICEJPR2 (ICEVCC) depends on the ICE chip operating voltage.
3. Switch the SW2 to OFF.

Table 2-10 presents all power models when supplies 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	Ignore	Ignore	1.8 V output
2	3.3 V	Connect to PC	3.3 V (default)	3.3 V (default)	3.3 V	Off	Ignore	Ignore	3.3 V output
3	5 V	Connect to PC	5V	3.3 V (default)	3.3 V	Off	Ignore	Ignore	5 V output
	X: Unused. **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.								

Table 2-10 Supply External Power through Nu-Link2-Me

2.5.8.2 *External Power Supply through M263 Platform to Target Chip*

The external power supply sources on M263 Platform are shown in Figure 2-6.

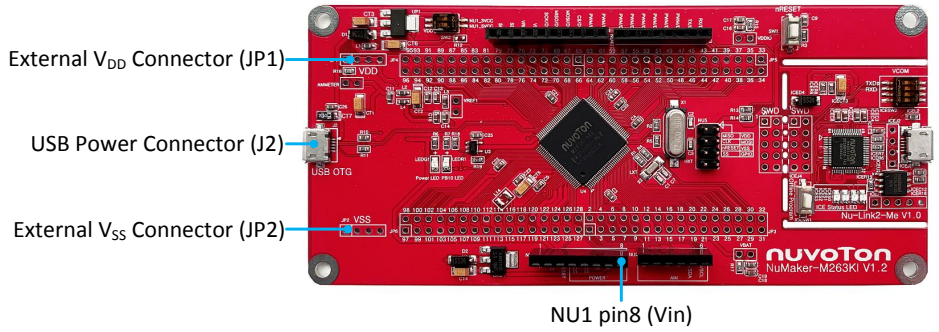

Figure 2-6 External Power Supply Sources on M263 Platform

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

1. Switch the SW2 depends on the target chip operating voltage.
2. Remove the resistor on ICEJPR1 (MCUVCC).
3. Solder the resistor on ICEJPR2 (ICEVCC) depends on the ICE chip operating voltage.
4. Connect the external power supply to VIN or J2.

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) depends on the ICE chip operating voltage.
4. Connect ICEJ3 to PC.
5. Connect the external power supply to JP1.

To use VIN or J2 as external power supply source with Nu-Link2-Me separated from NuMaker-M263KI, please follow the steps below:

1. Switch the SW2 depends on the target chip operating voltage.
2. Separate the Nu-Link2-Me from NuMaker-M263KI.
3. Connect the external power supply to VIN or J2.

To use JP1 as external power supply source with Nu-Link2-Me separated from NuMaker-M263KI, please follow the steps below:

1. Switch the SW2 to OFF.
2. Separate the Nu-Link2-Me from NuMaker-M263KI.
3. Connect the external power supply to JP1.

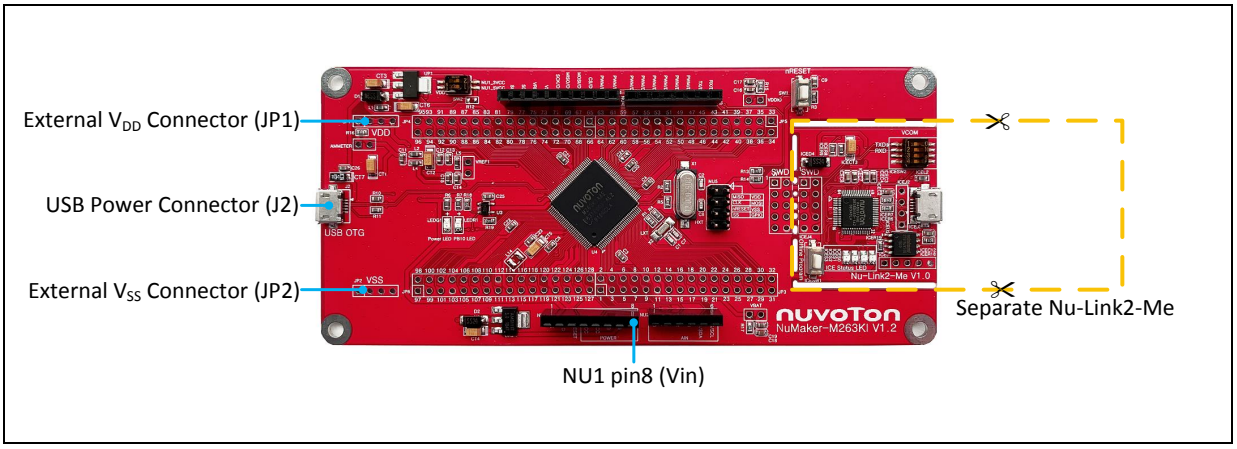

Figure 2-7 Separate the Nu-Link2-Me from NuMaker-M263KI

Table 2-11 presents all power models when supplies external power through M263 platform. The M263 platform external power sources are highlighted in yellow.

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

X: Unused.

Note:

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

Table 2-11 Supply External Power for M263 Platform

2.5.9 External Reference Voltage Connector

Table 2-13 presents the external reference voltage connector.

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

Table 2-12 External Reference Voltage Connector

2.5.10 Ammeter Connector

Table 2-13 presents the ammeter connector.

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

Table 2-13 Ammeter Connector

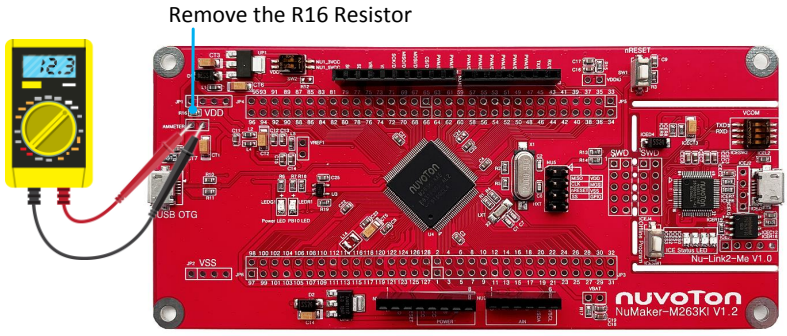

Figure 2-8 Wiring between Ammeter Connector and Ammeter

2.5.11 Extension Connectors

Table 2-14 presents the extension connectors.

Connector	Comment
JP3, JP4, JP5 and JP6	Full pins extension connectors on the NuMaker-M263KI.
NU1, NU2, NU3 and NU4	Arduino UNO compatible pins on the NuMaker-M263KI.

Table 2-14 Extension Connectors

2.5.12 Push-Buttons

Table 2-15 presents the push-buttons.

Component	Comment
ICESW1	Off-line program button to start off-line programming the target chip.
SW1	Reset button to reset the target chip.

Table 2-15 Push-Buttons

2.5.13 LEDs

Table 2-16 presents the LEDs.

Component	Comment
Power LED	The power LED indicates that the NuMaker-M263KI is powered.
PB10 LED	The LED is connected to the target chip PB.10.
ICES0, ICES1, ICES2 and ICES3	Nu-Link2-Me status LED.

Table 2-16 LEDs

2.6 Nu-Link2-Me

The Nu-Link2-Me is a debugger and programmer that supports on-line programming and debugging through SWD interface. The on-board 16 Mbit SPI Flash allows it to off-line program the target microcontroller. Additionally, the Nu-Link2-Me provides virtual COM port (VCOM) function to print out messages on PC. Table 2-17 presents how to set the VCOM function by ICESW2.

ICESW2		
Pin	**Function**	**Comment**
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: Pins 118 and 119 are unused.		

Table 2-17 VCOM Function of Nu-Link2-Me

2.7 PCB Placement

Figure 2-9 and Figure 2-10 show the front and rear placement of NuMaker-M263KI.

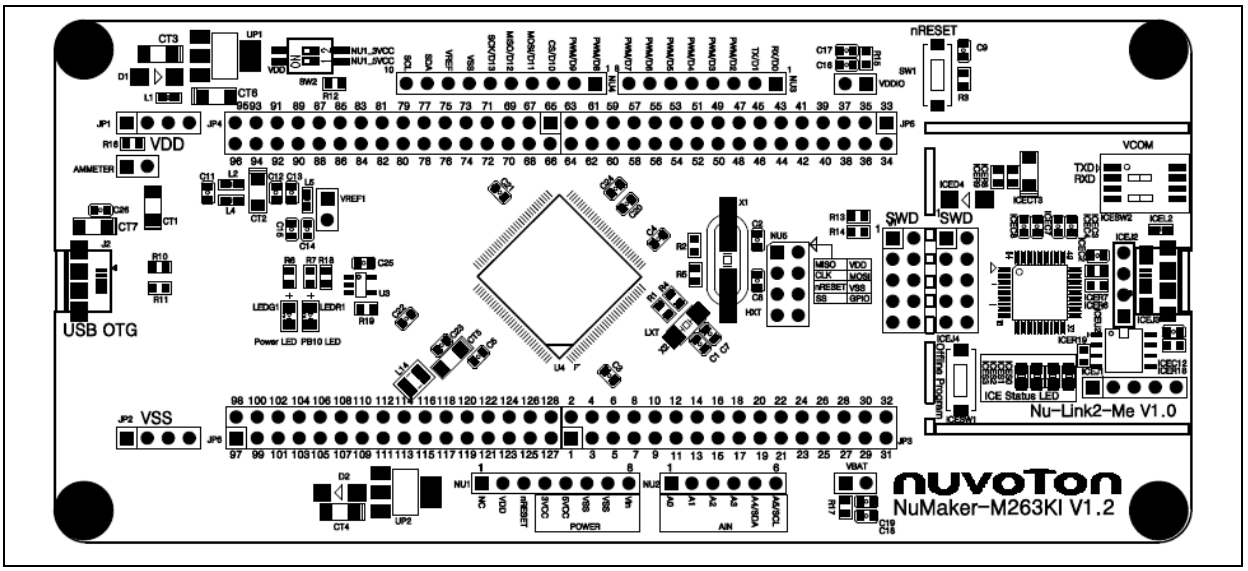

Figure 2-9 Front Placement

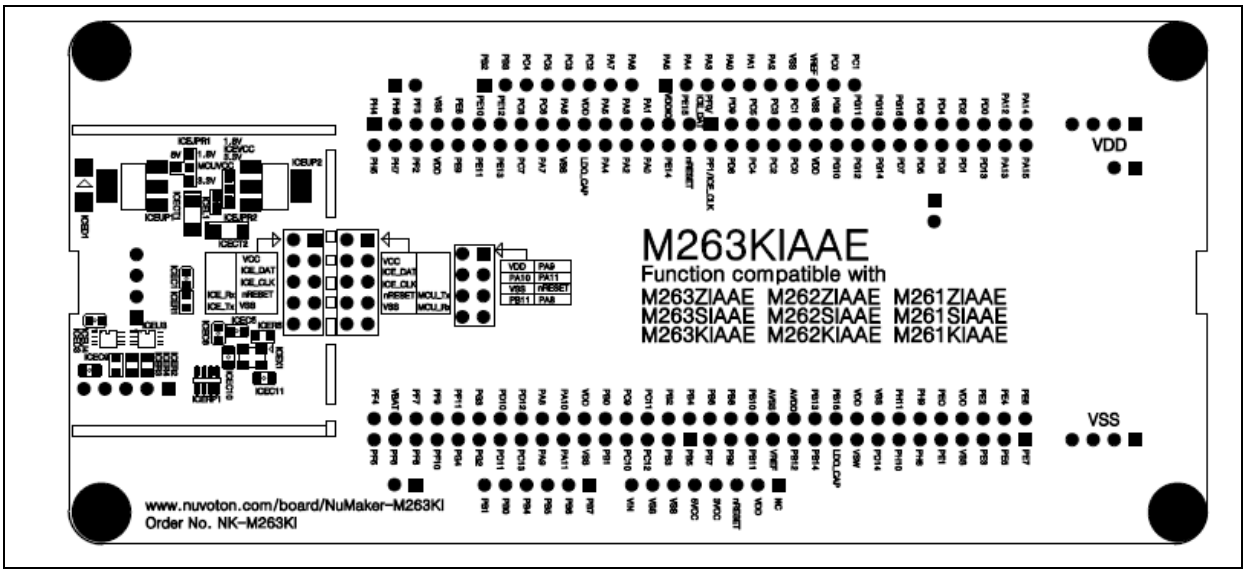

Figure 2-10 Rear Placement

3 QUICK START

3.1 Toolchains Support

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)(Windows)
- NuEclipse (GCC)(Linux)

3.2 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 3-1 and Figure 3-2.

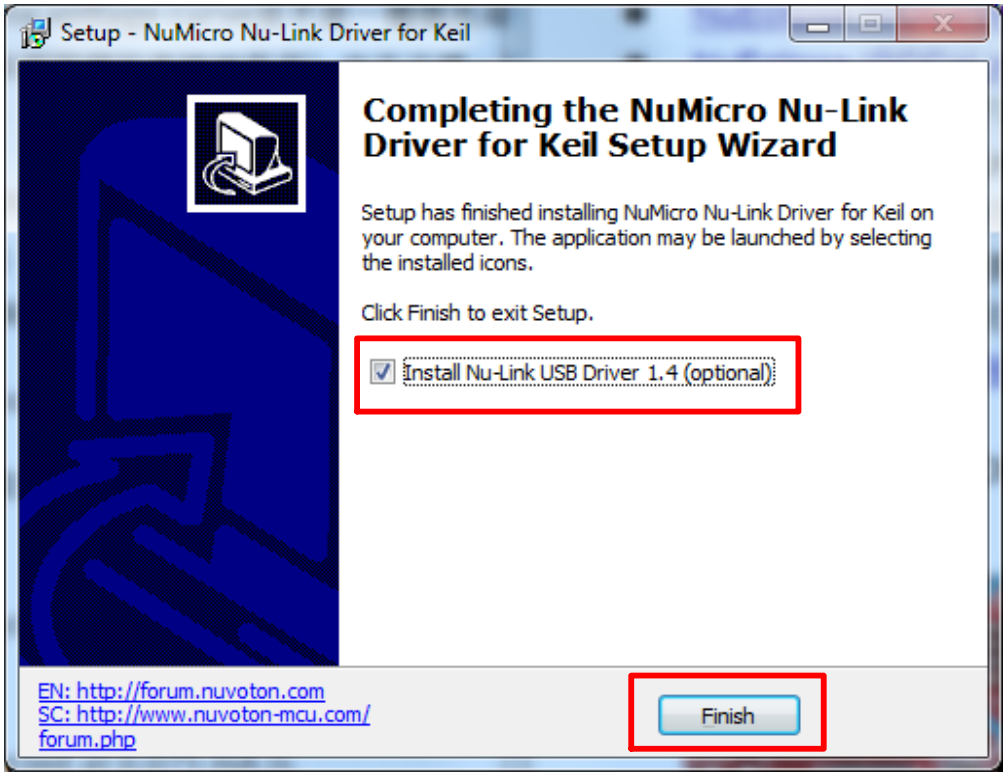

Figure 3-1 Nu-Link USB Driver Installation Setup

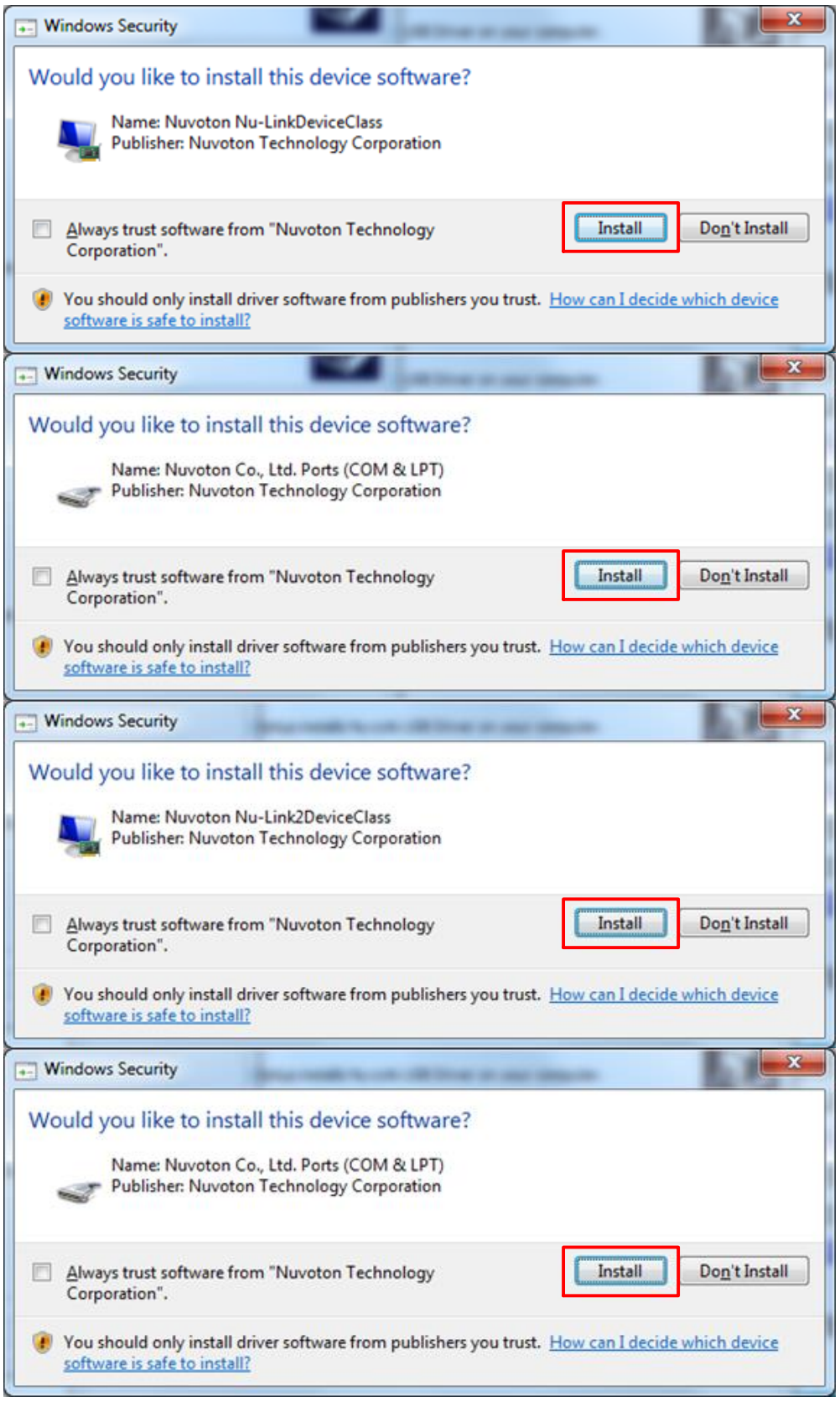

Figure 3-2 Nu-Link USB Driver Installation

3.3 BSP Firmware Download

Download and unzip the Board Support Package (BSP).

3.4 Hardware Setup

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

Figure 3-3 Open VCOM Function

2. Connect the ICE USB connector shown in Figure 3-4 to the PC USB port through USB cable.

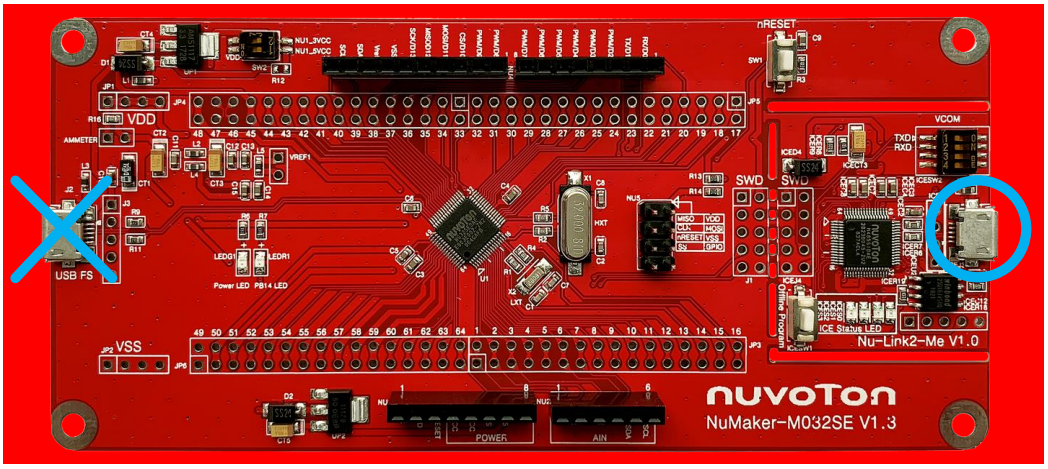

Figure 3-4 ICE USB Connector

3. Find the “Nuvoton Virtual COM Port” on the Device Manger as Figure 3-5.

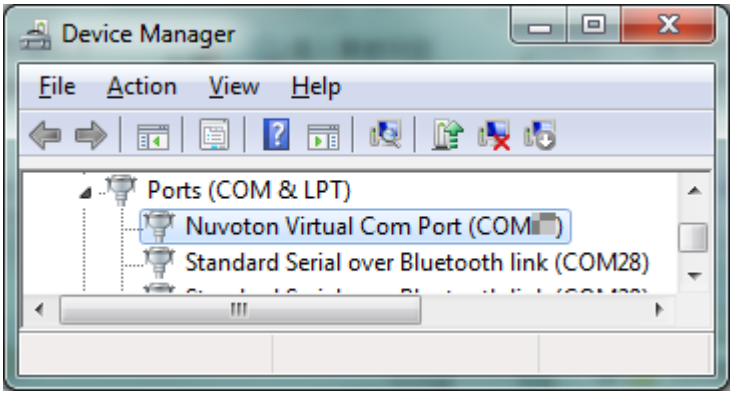

Figure 3-5 Device Manger

4. Open a serial port terminal, PuTTY for example, to print out debug message. Set the speed to 115200. Figure 3-6 presents the PuTTY session setting.

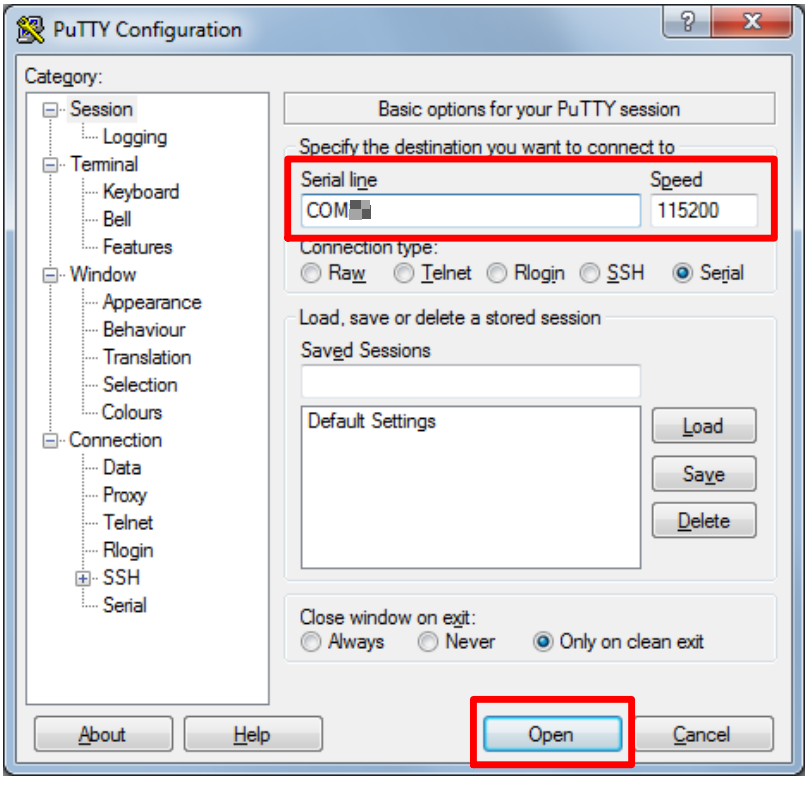

Figure 3-6 PuTTY Session Setting

3.5 Find the Example Project

Use the “Template” project as an example. The project can be found under the BSP folder as shown in Figure 3-7.

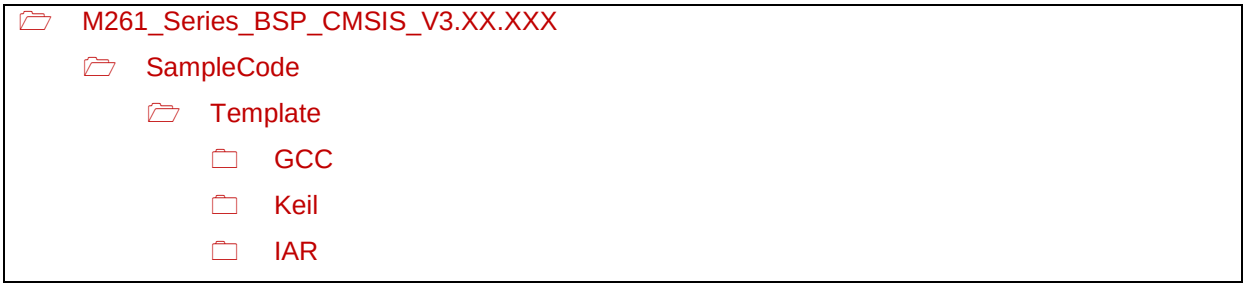

Figure 3-7 Template Project Folder Path

3.6 Execute the Project under Toolchains

Open and execute the project under the toolchain. The section 3.6.1, 0, and 3.6.3 describe the steps of executing project in Keil MDK, IAR EWARM and NuEclipse, respectively.

3.6.1 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.

   Note: If Figure 3-8 warning message jumps out, please migrate to version 5 formats as shown in Figure 3-9. The “.uvproj” filename extension will change to “.uvprojx”.

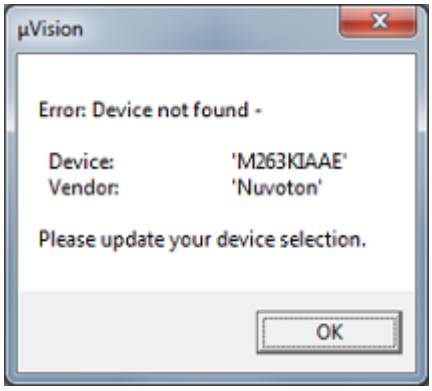

Figure 3-8 Warning Message “Device not found”

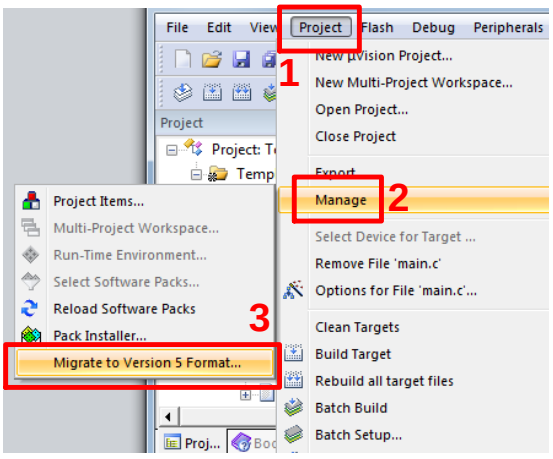

Figure 3-9 Project File Migrate to Version 5 Format

2. Make sure the debugger is “Nuvoton Nu-Link Debugger” as shown in Figure 3-10 and Figure 3-11.

   Note: If the dropdown menu in Figure 3-10 does not contain “Nuvoton Nu-Link Debugger” item, please rework section 3.2.

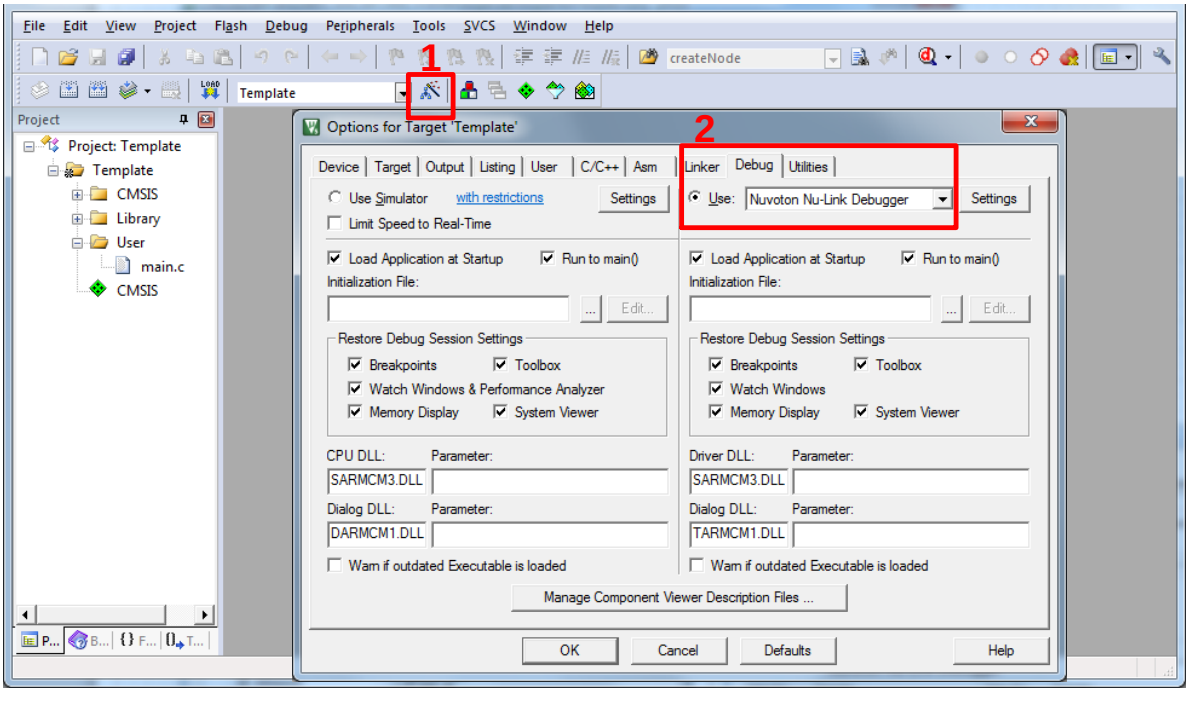

Figure 3-10 Debugger Setting in Options Window

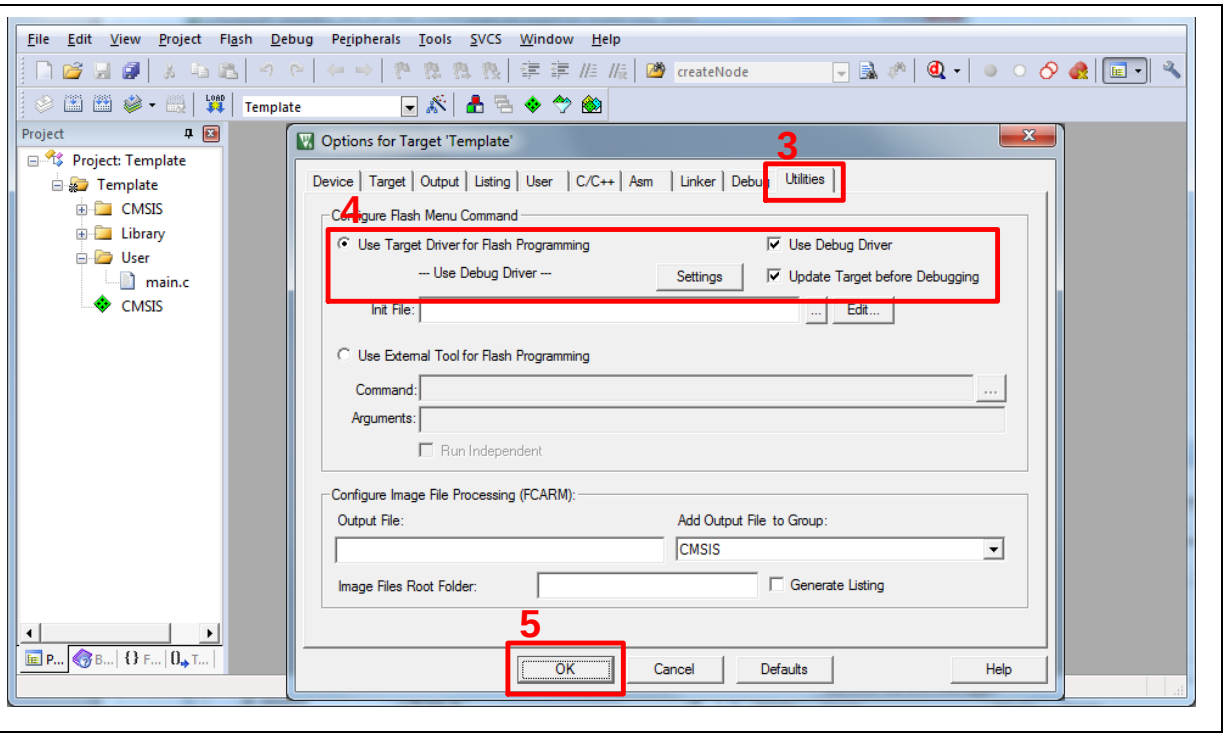

Figure 3-11 Programming Setting in Options Window

3. Rebuild all target files. After successfully compiling the project, download code to the Flash memory. Clicking “Start/Stop Debug Section” button can enter debug mode.

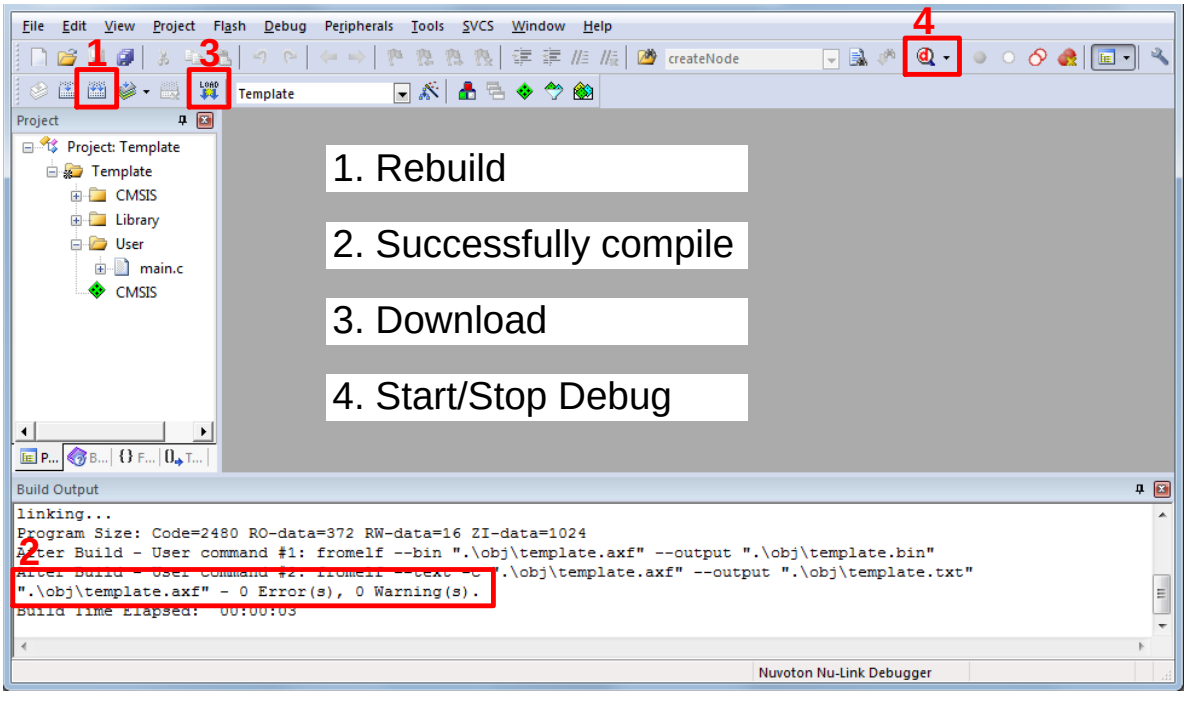

Figure 3-12 Compile and Download the Project

4. Figure 3-13 shows the debug mode under Keil MDK. Click “Run” and the debug message will be printed out as shown in Figure 3-14. User can debug the project under debug mode by checking

source code, assembly language, peripherals' registers, and setting breakpoint, step run, value monitor, etc.

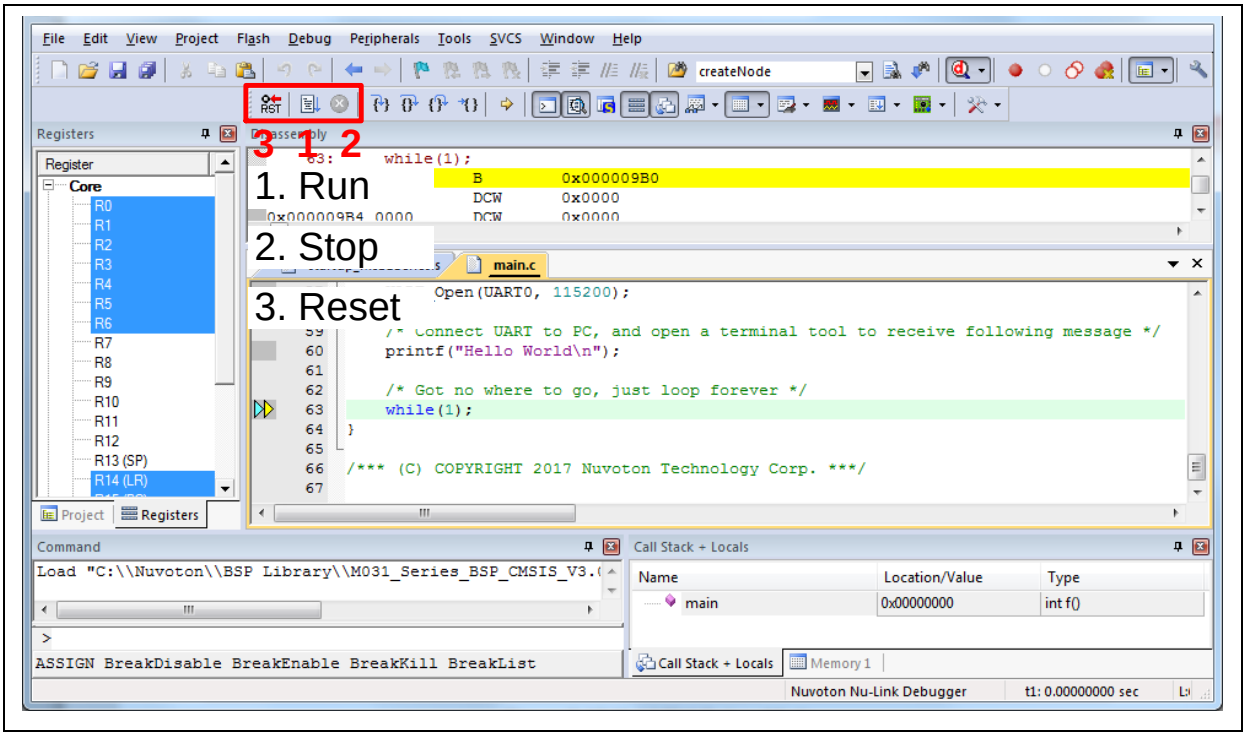

Figure 3-13 Keil MDK Debug Mode

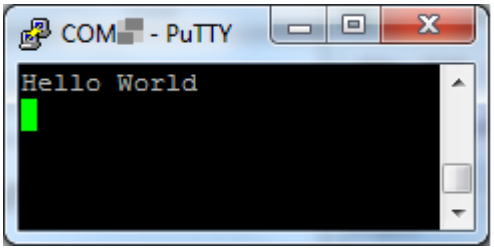

Figure 3-14 Debug Message on Serial Port Terminal Windows

3.6.2 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 contain “Nu-Link” item as shown in Figure 3-15.

   Note: If the toolbar does not contain “Nu-Link” item, please rework section 3.2.

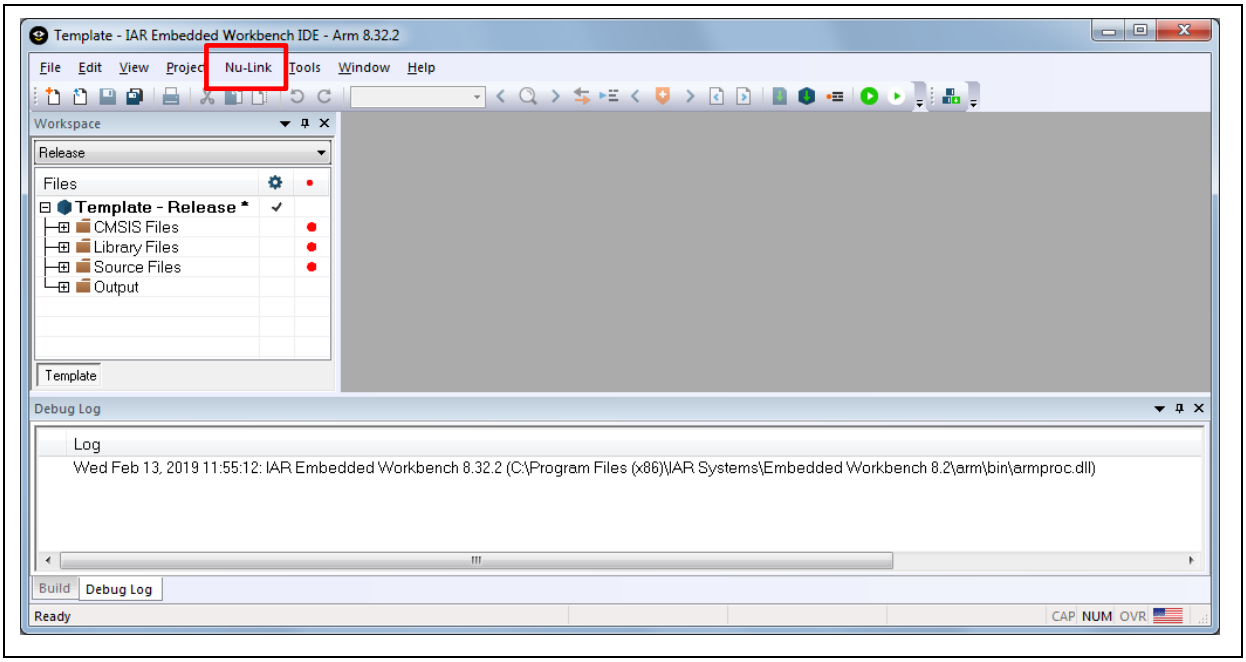

Figure 3-15 IAR EWARM Window

3. Make the target file as shown in Figure 3-16. After successfully compiling the project, download code to the Flash memory and enter debug mode.

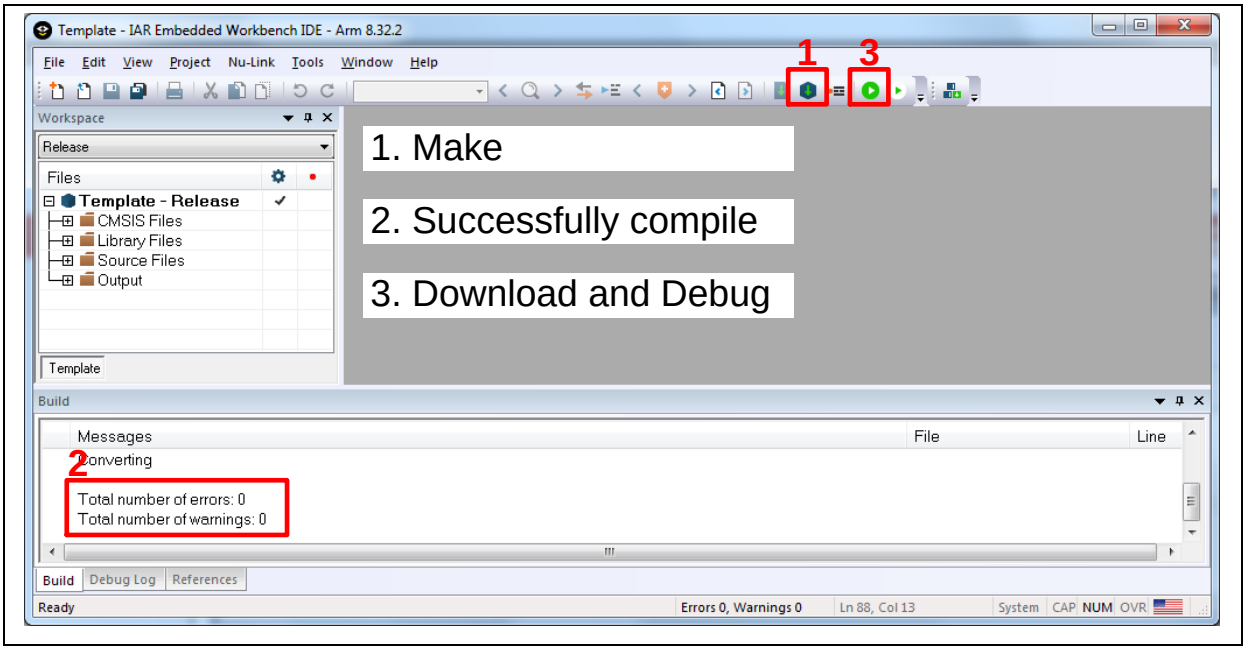

Figure 3-16 Compile and Download the Project

4. Figure 3-17 shows the debug mode under IAR EWARN. Click “Go” and the debug message will be printed out as shown in Figure 3-18. User can debug the project under debug mode by checking source code, assembly language, peripherals’ registers, and setting breakpoint, step run, value monitor, etc.

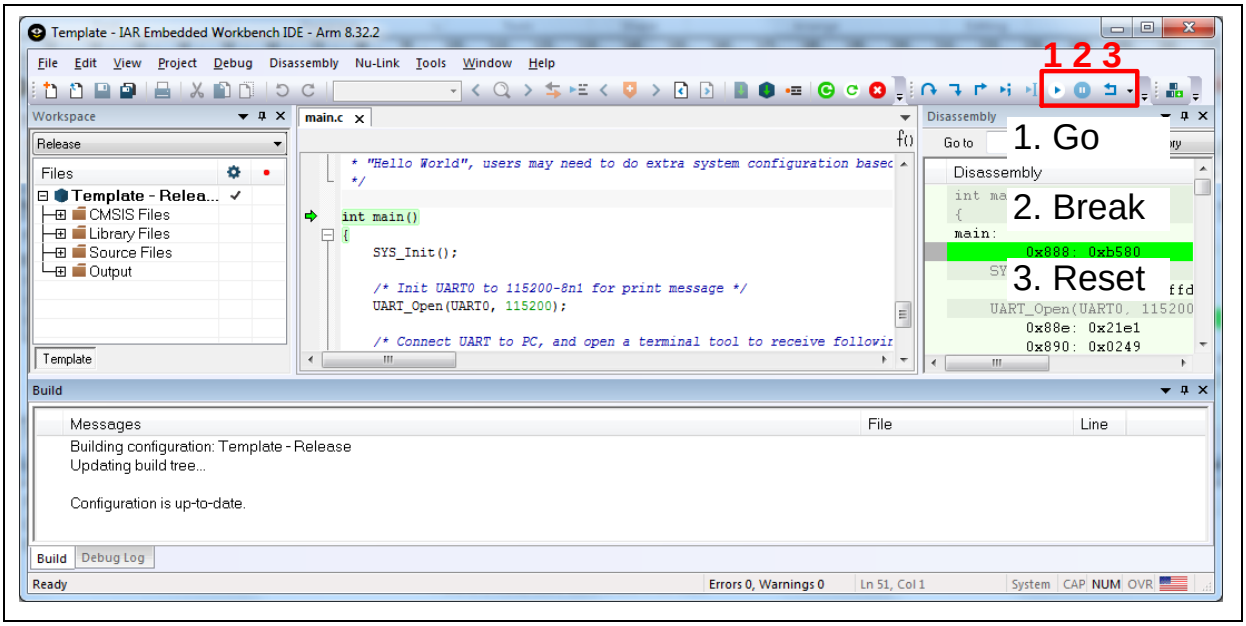

Figure 3-17 IAR EWARM Debug Mode

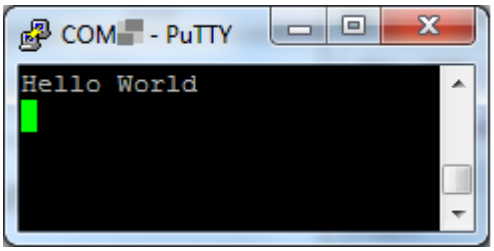

Figure 3-18 Debug Message on Serial Port Terminal Windows

3.6.3 NuEclipse

For more information about how to use NuEclipse, please refer to the NuEclipse User Manual.

4 NUMAKER-M263KI SCHEMATICS

4.1 Nu-Link2-Me

Figure 4-1 shows the Nu-Link2-Me circuit. The Nu-Link2-Me is a debugger and programmer that supports on-line programming and debugging through SWD interface.

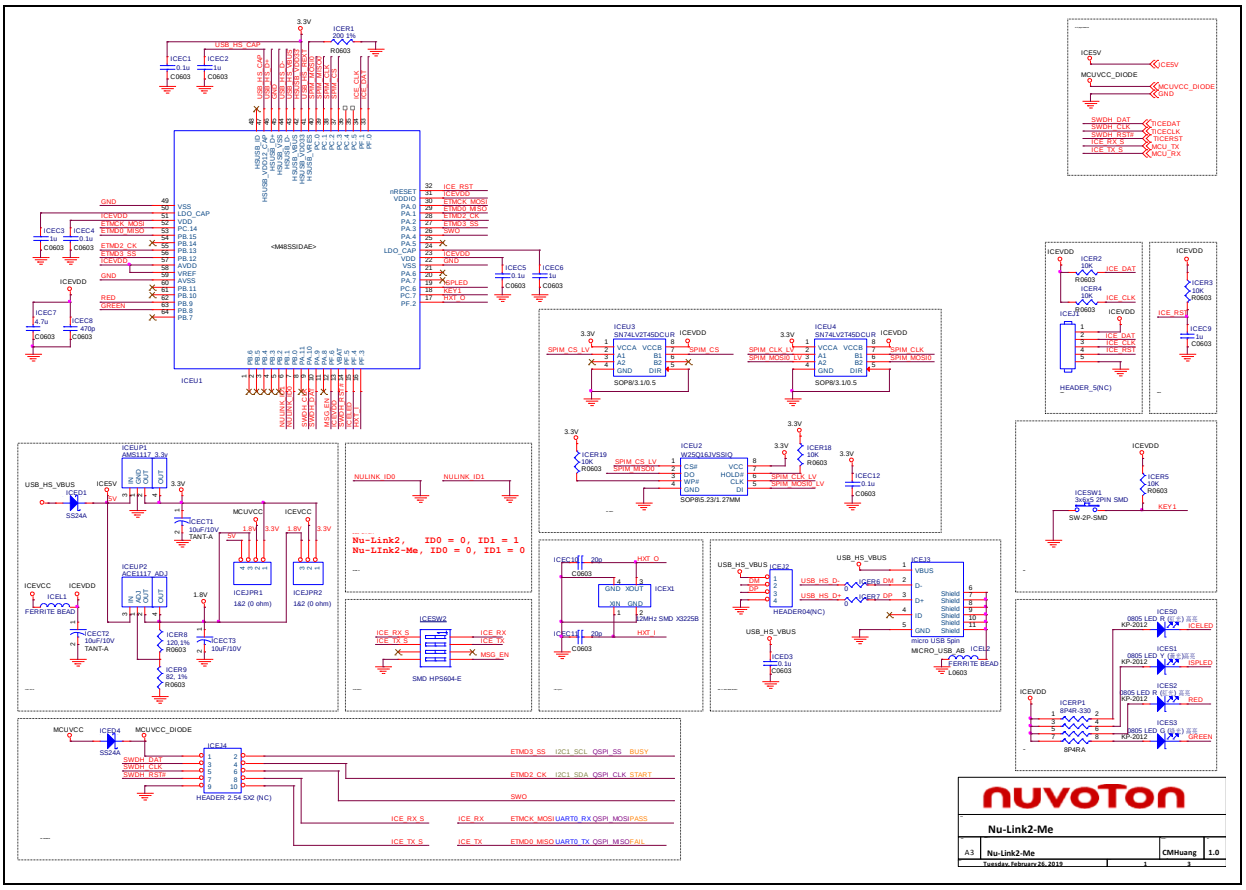

Figure 4-1 Nu-Link2-Me Circuit

4.2 M263 Platform

Figure 4-2 shows the M263 platform circuit.

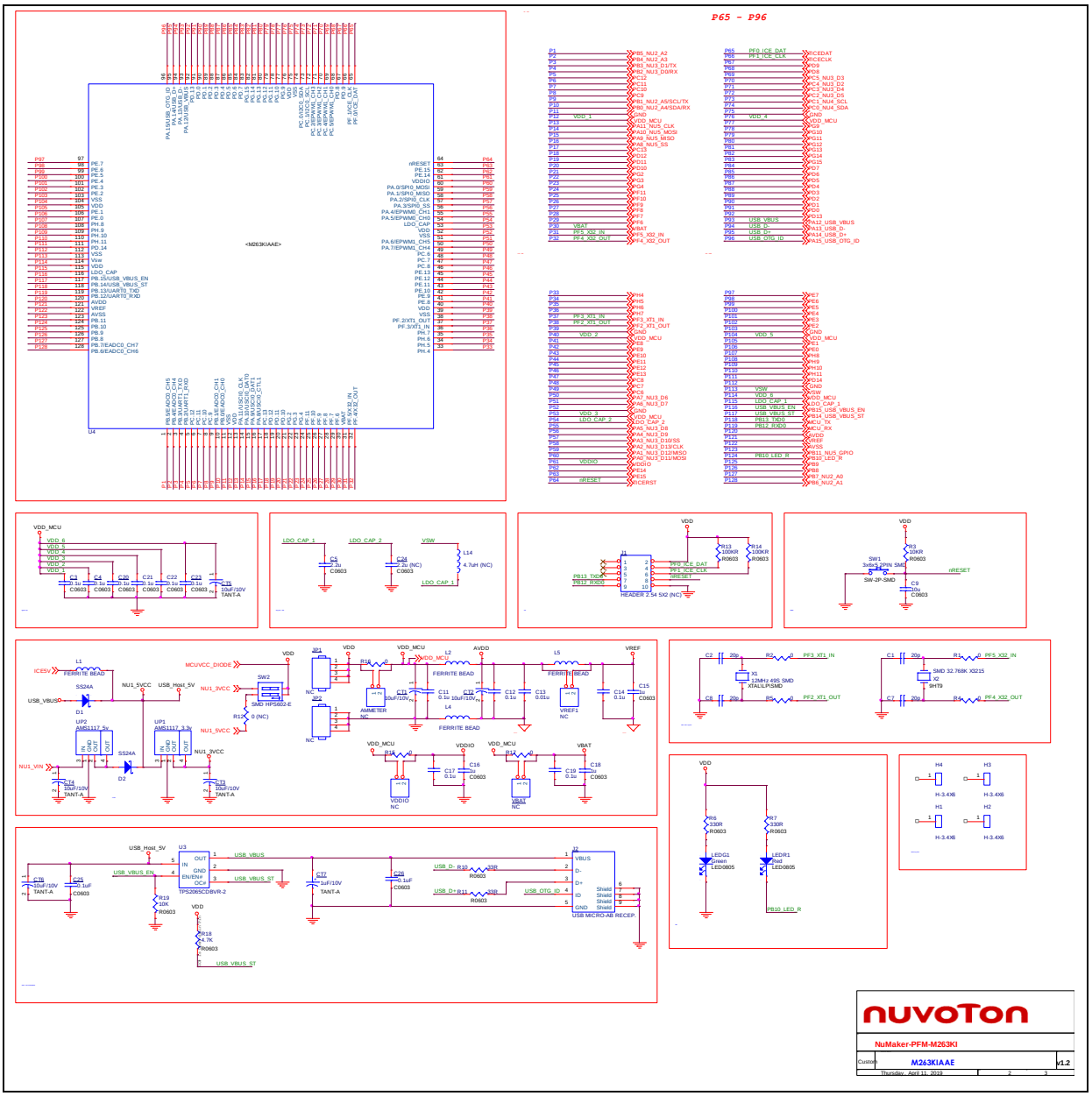

Figure 4-2 M263 Platform Circuit

4.3 Extension Connector

Figure 4-3 shows extension connectors of NuMaker-M263KI.

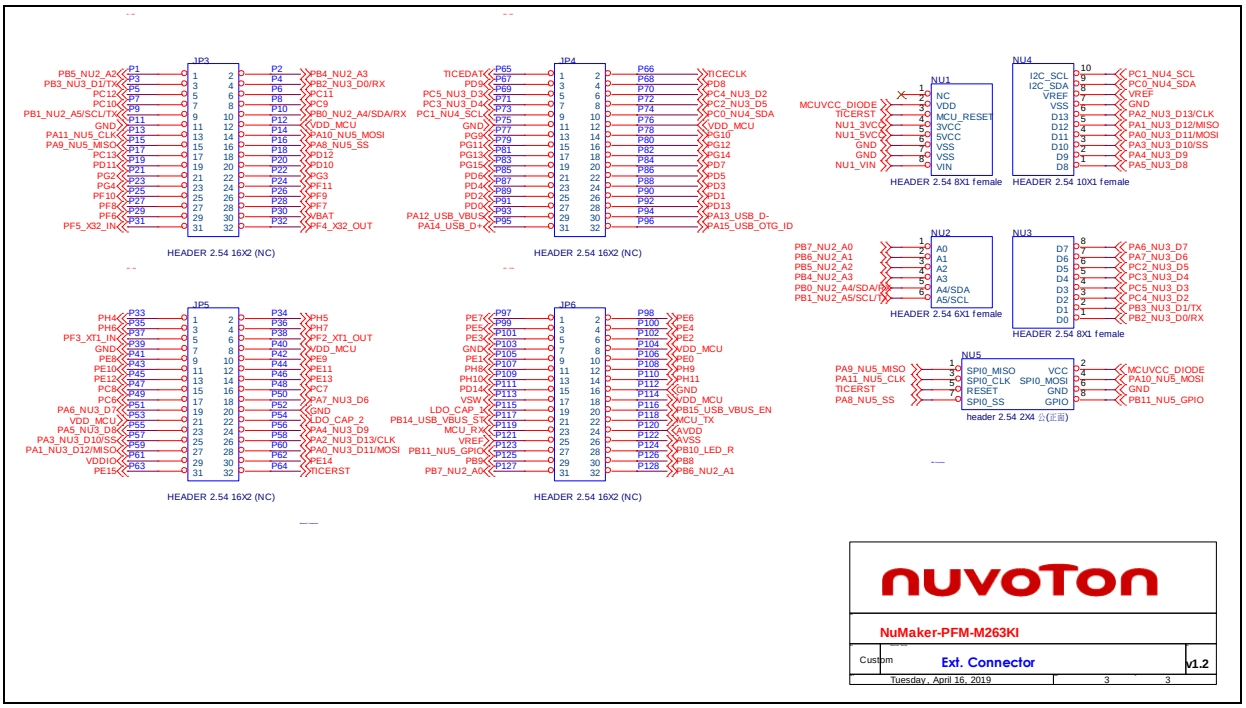

Figure 4-3 Extension Connectors Circuit

4.4 Errata

To use SPI function in the interface NU5 before the NuMaker-M263KI version 1.3, user should use USCI0 SPI mode rather than SPI0. The SS pin should use PA.8 GPIO function to manually control active/inactive instead of auto SS mode.

5 REVISION HISTORY

Date	Revision	Description
2019.04.16	1.00	1. Initially issued.

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