NuMaker-NUC029L

NuMicro® Family
Arm® Cortex®-M0-based Microcontroller

NuMaker-NUC029L
User Manual
Evaluation Board for NuMicro® NUC029xAN Series

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Dec. 26, 2022
Page 1 of 46
Rev 1.00
# Table of Contents

1 OVERVIEW ................................................................................................................................. 7

2 FEATURES ................................................................................................................................. 8

3 HARDWARE CONFIGURATION .................................................................................................... 9
  3.1 Front View ............................................................................................................................. 9
  3.2 Rear View ............................................................................................................................ 10
  3.3 Extension Connectors ........................................................................................................... 11
    3.3.1 Pin Assignment for Extension Connectors ..................................................................... 11
    3.3.2 Arduino UNO Compatible Extension Connectors ......................................................... 14
  3.4 Power Supply Configuration .................................................................................................. 16
    3.4.1 VIN Power Source ........................................................................................................ 16
    3.4.2 5 V Power Sources ...................................................................................................... 16
    3.4.3 3.3 V Power Sources .................................................................................................. 17
    3.4.4 1.8 V Power Sources .................................................................................................. 17
    3.4.5 Power Connectors ......................................................................................................... 17
    3.4.6 USB Connectors ........................................................................................................... 18
    3.4.7 Power Switches ............................................................................................................. 18
    3.4.8 Power Supply Models .................................................................................................... 18
  3.5 Ammeter Connector ................................................................................................................ 21
  3.6 Push Buttons .......................................................................................................................... 22
  3.7 LEDs ..................................................................................................................................... 23
  3.8 Nu-Link2-Me ......................................................................................................................... 23
    3.8.1 VCOM Switches ........................................................................................................... 23
    3.8.2 Status LEDs ................................................................................................................ 24

4 QUICK START ............................................................................................................................. 25
  4.1 Toolchains Supporting .......................................................................................................... 25
  4.2 Nuvoton Nu-Link Driver Installation .................................................................................... 25
  4.3 BSP Firmware Download ...................................................................................................... 27
  4.4 Hardware Setup ..................................................................................................................... 27
  4.5 Find the Example Project ..................................................................................................... 29
  4.6 Execute the Project under Toolchains ................................................................................. 29
    4.6.1 Keil MDK ...................................................................................................................... 29
    4.6.2 IAR EWARM ............................................................................................................... 33
    4.6.3 NuEclipse ..................................................................................................................... 35

5 NUMAKER-NUC029L SCHEMATICS ......................................................................................... 41
  5.1 Nu-Link2-Me ......................................................................................................................... 41
  5.2 NUC029 Target Board .......................................................................................................... 42
5.3 Extension Connectors ........................................................................................................ 43
5.4 PCB Placement .................................................................................................................. 44

6  REVISION HISTORY ............................................................................................................. 45
List of Figures

Figure 1-1 NuMaker-NUC029L Evaluation Board......................................................... 7
Figure 3-1 Front View of NuMaker-NUC029L................................................................. 9
Figure 3-2 Rear View of NuMaker-NUC029L................................................................. 10
Figure 3-3 NUC029LAN Extension Connectors............................................................ 11
Figure 3-4 Arduino UNO Compatible Extension Connectors........................................... 14
Figure 3-5 External Power Supply Sources on Nu-Link2-Me .......................................... 18
Figure 3-6 External Power Supply Sources on NUC029 Target Board............................. 19
Figure 3-7 Detach the Nu-Link2-Me from NuMaker-NUC029L........................................ 20
Figure 3-8 Wiring between Ammeter Connector and Ammeter......................................... 22
Figure 3-9 Project Path of SYS_PowerDown_MinCurrent ............................................. 22
Figure 4-1 Nu-Link USB Driver Installation Setup......................................................... 25
Figure 4-2 Nu-Link USB Driver Installation................................................................. 26
Figure 4-3 Open VCOM Function .................................................................................. 27
Figure 4-4 ICE USB Connector....................................................................................... 27
Figure 4-5 Device Manger.............................................................................................. 28
Figure 4-6 PuTTY Session Setting................................................................................... 28
Figure 4-7 Template Project Folder Path ....................................................................... 29
Figure 4-8 Warning Message of “Device not found”....................................................... 29
Figure 4-9 Project File Migrate to Version 5 Format....................................................... 30
Figure 4-10 Debugger Setting in Options Window............................................................ 30
Figure 4-11 Programming Setting in Options Window .................................................... 31
Figure 4-12 Compile and Download the Project............................................................... 31
Figure 4-13 Keil MDK Debug Mode ............................................................................. 32
Figure 4-14 Debug Message on Serial Port Terminal Windows........................................ 32
Figure 4-15 IAR EWARM Window .............................................................................. 33
Figure 4-16 Compile and Download the Project ............................................................... 33
Figure 4-17 IAR EWARM Debug Mode ....................................................................... 34
Figure 4-18 Debug Message on Serial Port Terminal Windows....................................... 34
Figure 4-19 Import the Project in NuEclipse .................................................................. 35
Figure 4-20 Import Projects Windows ........................................................................... 35
Figure 4-21 Open Project Properties Window ............................................................... 36
Figure 4-22 Project Properties Settings ......................................................................... 36
Figure 4-23 Build Project .............................................................................................. 37
Figure 4-24 Open Debug Configuration ........................................................................ 37
Figure 4-25 Main Tab Configuration ............................................................................. 38
Figure 4-26 Debugger Tab Configuration ..................................................................... 38
Figure 4-27 Startup Tab Configuration .............................................................. 39
Figure 4-28 NuEclipse Debug Mode ............................................................... 40
Figure 4-29 Debug Message on Serial Port Terminal Windows ..................... 40
Figure 5-1 Nu-Link2-Me Circuit ................................................................. 41
Figure 5-2 NUC029 Target Board Circuit .................................................... 42
Figure 5-3 Extension Connectors Circuit ...................................................... 43
Figure 5-4 Front Placement ........................................................................ 44
Figure 5-5 Rear Placement ........................................................................ 44
**List of Tables**

Table 3-1 Extension Connectors........................................................................................................................................ 11
Table 3-2 NUC029LAN Full-pin Extension Connectors and GPIO Function List ...................................................... 13
Table 3-3 Arduino UNO Extension Connectors and NUC029LAN Mapping GPIO List........................................... 15
Table 3-4 Vin Power Source .................................................................................................................................................. 16
Table 3-5 5 V Power Sources .............................................................................................................................................. 16
Table 3-6 3.3 V Power Sources ............................................................................................................................................ 17
Table 3-7 1.8 V Power Sources ............................................................................................................................................ 17
Table 3-8 Power Connectors .................................................................................................................................................. 17
Table 3-9 USB Connectors ...................................................................................................................................................... 18
Table 3-10 Power Switches ..................................................................................................................................................... 18
Table 3-11 Supply External Power through Nu-Link2-Me ............................................................................................... 19
Table 3-12 Supply External Power for NUC029 Target Board .................................................................................... 21
Table 3-14 Ammeter Connector ......................................................................................................................................... 21
Table 3-15 Push Buttons ......................................................................................................................................................... 22
Table 3-16 LEDs ..................................................................................................................................................................... 23
Table 3-17 VCOM Function of Nu-Link2-Me ..................................................................................................................... 23
Table 3-18 Operation Status LED Patterns ...................................................................................................................... 24
1 OVERVIEW

The NuMaker-NUC029L is an evaluation board for Nuvoton NuMicro NUC029LAN, NUC029NAN, NUC029ZAN and NUC029TAN microcontrollers. The NuMaker-NUC029L consists of two parts: an NUC029 target board and an on-board Nu-Link2-Me debugger and programmer. The NuMaker-NUC029L is designed for project evaluation, prototype development and validation with power consumption monitoring function.

The NUC029 target board is based on NuMicro NUC029LAN. For the development flexibility, the NUC029 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-NUC029L Evaluation Board](image)
2 FEATURES

- NuMicro NUC029LAN used as main microcontroller with function compatible with:
  - NUC029LAN
  - NUC029NAN
  - NUC029ZAN
  - NUC029TAN

- NUC029LAN full pins extension connectors
- Arduino UNO compatible extension connectors
- Ammeter connector for measuring the microcontroller’s power consumption

- Flexible board power supply:
  - External VDD power connector
  - Arduino UNO compatible extension connector Vin
  - USB PWR connector on NUC029 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-NUC029L

Figure 3-1 shows the main components and connectors from the front side of NuMaker-NUC029L. The following lists components and connectors from the front view:

- Target chip: NUC029LAN (U1)
- USB PWR Connector (J2)
- Arduino UNO Compatible Extension Connectors (NU1, NU2, NU3, NU4)
- External V_DD Power Connector (JP1)
- External V_SS Power Connector (JP2)
- V_DD Switch (SW2)
- Ammeter Connector (AMMETER)
- Reset Button (SW1)
- Power LED and P3.6 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)
3.2 Rear View

Figure 3-2 shows the main components and connectors from the rear side of NuMaker-NUC029L. The following lists components and connectors from the rear view:

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

Table 3-1 presents the extension connectors.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NU1, NU2, NU3 and NU4</td>
<td>Arduino UNO compatible pins on the NuMaker-NUC029L.</td>
</tr>
</tbody>
</table>

Table 3-1 Extension Connectors

3.3.1 Pin Assignment for Extension Connectors

The NuMaker-NUC029L provides the NUC029LAN onboard and extension connectors (JP3, JP4, JP5 and JP6). Figure 3-3 shows the NUC029LAN extension connectors.
<table>
<thead>
<tr>
<th>Header</th>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP3</td>
<td>1</td>
<td>P1.5 / AIN5 / ACMP0_P / MOSI_0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>P1.6 / AIN6 / MISO_0 / ACMP2_N</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>P1.7 / AIN7 / SPICLK0 / ACMP2_P</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>nRST</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>P3.0 / UART0_RXD / ACMP1_N</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>AVss</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>P3.1 / UART0_TXD / ACMP1_P</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>P3.2 / nINT0 / STADC / T0EX</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>P3.3 / nINT1 / MCLK / T1EX</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>P3.4 / T0 / SDA0</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>P3.5 / T1 / SCL0 / CKO</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>P4.3 / PWM3</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>P3.6 / CKO / ACMP0_O / nWR</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>P3.7 / nRD</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>XTAL2</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>XTAL1</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Vss</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>LDO_CAP</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>P2.0 / AD8 / PWM0</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>P2.1 / AD9 / PWM1</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>P2.2 / PWM2 / AD10</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>P2.3 / PWM3 / AD11</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>P2.4 / PWM4 / SCL1 / AD12</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>P4.0 / PWM0 / T2EX</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>P2.5 / PWM5 / SDA1 / AD13</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>P2.6 / PWM6 / ACMP1_O / AD14</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>P2.7 / AD15 / PWM7</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>P4.4 / nCS / SCL1</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>P4.5 / ALE / SDA1</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>P4.6 / ICE_CLK</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>P4.7 / ICE_DAT</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>P0.7 / SPICLK1 / AD7</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>P0.6 / MISO_1 / AD6</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>P0.5 / MOSI_1 / AD5</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>P0.4 / SPISS1 / AD4</td>
</tr>
<tr>
<td>Header</td>
<td>Pin No.</td>
<td>Function</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>JP4.12</td>
<td>36</td>
<td>P4.1 / PWM1 / T3EX</td>
</tr>
<tr>
<td>JP6.1</td>
<td>37</td>
<td>P0.3 / AD3 / RTS0 / UART0_RXD</td>
</tr>
<tr>
<td>JP6.2</td>
<td>38</td>
<td>P0.2 / AD2 / CTS0 / UART0_TXD</td>
</tr>
<tr>
<td>JP6.3</td>
<td>39</td>
<td>P0.1 / RTS1 / RXD1 / ACMP3_N / AD1</td>
</tr>
<tr>
<td>JP6.4</td>
<td>40</td>
<td>P0.0 / CTS1 / TXD1 / ACMP3_P / AD0</td>
</tr>
<tr>
<td>JP6.5</td>
<td>41</td>
<td>VDD</td>
</tr>
<tr>
<td>JP6.6</td>
<td>42</td>
<td>AVDD</td>
</tr>
<tr>
<td>JP6.7</td>
<td>43</td>
<td>P1.0 / AIN0 / T2 / nWRL</td>
</tr>
<tr>
<td>JP6.8</td>
<td>44</td>
<td>P1.1 / AIN1 / T3 / nWRH</td>
</tr>
<tr>
<td>JP6.9</td>
<td>45</td>
<td>P1.2 / AIN2 / UART1_RXD1</td>
</tr>
<tr>
<td>JP6.10</td>
<td>46</td>
<td>P1.3 / AIN3 / UART1_TXD1</td>
</tr>
<tr>
<td>JP6.11</td>
<td>47</td>
<td>P1.4 / AIN4 / ACMP0_N / SPISS0</td>
</tr>
<tr>
<td>JP6.12</td>
<td>48</td>
<td>P4.2 / PWM2</td>
</tr>
</tbody>
</table>

Table 3-2 NUC029LAN 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.
### Table 3-3 Arduino UNO Extension Connectors and NUC029LAN Mapping GPIO List

<table>
<thead>
<tr>
<th>Header</th>
<th>NuMaker-NUC029L (Compatible to Arduino UNO)</th>
<th>Header</th>
<th>NuMaker-NUC029L (Compatible to Arduino UNO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NU3.1</td>
<td>D0</td>
<td>P0.1</td>
<td>NU2.6</td>
</tr>
<tr>
<td>NU3.2</td>
<td>D1</td>
<td>P0.0</td>
<td>NU2.5</td>
</tr>
<tr>
<td>NU3.3</td>
<td>D2</td>
<td>P4.2</td>
<td>NU2.4</td>
</tr>
<tr>
<td>NU3.4</td>
<td>D3</td>
<td>P4.3</td>
<td>NU2.3</td>
</tr>
<tr>
<td>NU3.5</td>
<td>D4</td>
<td>P2.4</td>
<td>NU2.2</td>
</tr>
<tr>
<td>NU3.6</td>
<td>D5</td>
<td>P2.5</td>
<td>NU2.1</td>
</tr>
<tr>
<td>NU3.7</td>
<td>D6</td>
<td>P2.6</td>
<td>NU1.8</td>
</tr>
<tr>
<td>NU3.8</td>
<td>D7</td>
<td>P2.7</td>
<td>NU1.7</td>
</tr>
<tr>
<td>NU4.1</td>
<td>D8</td>
<td>P4.0</td>
<td>NU1.6</td>
</tr>
<tr>
<td>NU4.2</td>
<td>D9</td>
<td>P4.1</td>
<td>NU1.5</td>
</tr>
<tr>
<td>NU4.3</td>
<td>D10</td>
<td>P0.4</td>
<td>NU1.4</td>
</tr>
<tr>
<td>NU4.4</td>
<td>D11</td>
<td>P0.5</td>
<td>NU1.3</td>
</tr>
<tr>
<td>NU4.5</td>
<td>D12</td>
<td>P0.6</td>
<td>NU1.2</td>
</tr>
<tr>
<td>NU4.6</td>
<td>D13</td>
<td>P0.7</td>
<td>NU1.1</td>
</tr>
<tr>
<td>NU4.7</td>
<td>VSS</td>
<td>V_{SS}</td>
<td></td>
</tr>
<tr>
<td>NU4.8</td>
<td>VREF</td>
<td>V_{AV}</td>
<td></td>
</tr>
<tr>
<td>NU4.9</td>
<td>SDA</td>
<td>P3.4</td>
<td></td>
</tr>
<tr>
<td>NU4.10</td>
<td>SCL</td>
<td>P3.5</td>
<td></td>
</tr>
</tbody>
</table>
3.4 Power Supply Configuration

The NuMaker-NUC029L is able to adopt multiple power supplies. External power sources include NU1 Vin (7 V to 12 V), VDD (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-NUC029L.

3.4.1 VIN Power Source

Table 3-4 presents the Vin power source.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Net Name in Schematic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NU1 pin8</td>
<td>NU1_VIN</td>
<td>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.</td>
</tr>
</tbody>
</table>

Table 3-4 Vin Power Source

3.4.2 5 V Power Sources

Table 3-5 presents the 5 V power sources.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Net Name in Schematic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICEJ3</td>
<td>USB_HS_VBUS</td>
<td>ICE USB connector supplies 5 V power from PC to NUC029 target board and Nu-Link2-Me.</td>
</tr>
<tr>
<td>J2</td>
<td>USB_VBUS</td>
<td>USB connector on NuMaker-NUC029L supplies 5 V power from PC to NUC029 target board and Nu-Link2-Me.</td>
</tr>
<tr>
<td>NU1 pin5</td>
<td>NU1_5VCC</td>
<td>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.</td>
</tr>
</tbody>
</table>

Table 3-5 5 V Power Sources
3.4.3 3.3 V Power Sources
Table 3-6 presents the 3.3 V power sources.

<table>
<thead>
<tr>
<th>Voltage Regulator</th>
<th>5 V Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICEUP1</td>
<td>USB_HS_VBUS</td>
<td>ICEUP1 converts USB_HS_VBUS to 3.3 V and supplies 3.3 V to NUC029 target board or ICE chip.</td>
</tr>
<tr>
<td>UP1</td>
<td>USB_VBUS</td>
<td>UP1 converts USB_VBUS to 3.3 V and supplies 3.3 V to NUC029 target board.</td>
</tr>
<tr>
<td></td>
<td>NU1_5VCC</td>
<td>UP1 converts NU1_5VCC to 3.3 V and supplies 3.3 V to NUC029 target board.</td>
</tr>
</tbody>
</table>

Table 3-6 3.3 V Power Sources

3.4.4 1.8 V Power Sources
Table 3-7 presents the 1.8 V power source.

<table>
<thead>
<tr>
<th>Voltage Regulator</th>
<th>5V Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICEUP2</td>
<td>USB_HS_VBUS</td>
<td>ICEUP2 converts USB_HS_VBUS to 1.8 V and supplies 1.8 V to NUC029 target board or ICE chip.</td>
</tr>
</tbody>
</table>

Table 3-7 1.8 V Power Sources

3.4.5 Power Connectors
Table 3-8 presents the power connectors.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP1</td>
<td>VDD connector on the NuMaker-NUC029L.</td>
</tr>
<tr>
<td>JP2</td>
<td>VSS connector on the NuMaker-NUC029L.</td>
</tr>
</tbody>
</table>

Table 3-8 Power Connectors
3.4.6 USB Connectors
Table 3-9 presents the USB connectors.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICEJ3</td>
<td>ICE USB connector on Nu-Link2-Me for power supply, debugging and programming from PC.</td>
</tr>
<tr>
<td>J2</td>
<td>USB PWR connector on NuMaker-NUC029L for power supply.</td>
</tr>
</tbody>
</table>

Table 3-9 USB Connectors

3.4.7 Power Switches
Table 3-10 presents the power switches.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICEJPR1</td>
<td>Configures the target chip operating voltage at 1.8 V / 3.3 V / 5 V.</td>
</tr>
<tr>
<td>ICEJPR2</td>
<td>Configures the ICE chip operating voltage at 1.8 V / 3.3 V.</td>
</tr>
<tr>
<td>SW2</td>
<td>Configures the target chip operating voltage at 3.3 V / 5 V.</td>
</tr>
</tbody>
</table>

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](image)

To use ICEJ3 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 ICEJ3.

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.

<table>
<thead>
<tr>
<th>Model</th>
<th>Target Chip Voltage</th>
<th>ICEJ3</th>
<th>ICEJPR1 (MCUVCC) Selection</th>
<th>ICEJPR2 (ICEVCC) Selection</th>
<th>ICE Chip Voltage</th>
<th>SW2 Selection</th>
<th>J2</th>
<th>Vin</th>
<th>JP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.8 V</td>
<td>Connect to PC</td>
<td>1.8 V</td>
<td>1.8 V</td>
<td>Off</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.8 V output</td>
</tr>
<tr>
<td>2</td>
<td>3.3 V</td>
<td>Connect to PC</td>
<td>3.3 V (default)</td>
<td>3.3 V (default)</td>
<td>3.3 V</td>
<td>Off</td>
<td>-</td>
<td>-</td>
<td>3.3 V output</td>
</tr>
<tr>
<td>3</td>
<td>5 V</td>
<td>Connect to PC</td>
<td>5 V</td>
<td>3.3 V (default)</td>
<td>3.3 V</td>
<td>Off</td>
<td>-</td>
<td>-</td>
<td>5 V output</td>
</tr>
</tbody>
</table>

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.

3.4.8.2 External Power Supply through NUC029 Target Board to Target Chip

The external power supply sources on NUC029 target board are shown in Figure 3-6.

To use Vin or J2 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 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) depending 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 detached from NuMaker-NUC029L, please follow the steps below:**
1. Switch the SW2 depending on the target chip operating voltage.
2. Detach the Nu-Link2-Me from NuMaker-NUC029L.
3. Connect the external power supply to Vin or J2.

**To use JP1 as external power supply source with Nu-Link2-Me detached from NuMaker-NUC029L, please follow the steps below:**
1. Switch the SW2 to OFF.
2. Detach the Nu-Link2-Me from NuMaker-NUC029L.
3. Connect the external power supply to JP1.

![Figure 3-7 Detach the Nu-Link2-Me from NuMaker-NUC029L](imageURL)
Table 3-12 presents all power models when supplies external power through NUC029 target board. The NUC029 target board external power sources are highlighted in yellow.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3.3 V</td>
<td>7 V ~ 12 V</td>
<td>-</td>
<td>-</td>
<td>NU1 3VCC</td>
<td>3.3 V output</td>
<td>Remove resistor</td>
<td>3.3 V / 3.3 V</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5 V</td>
<td>7 V ~ 12 V</td>
<td>-</td>
<td>-</td>
<td>NU1 5VCC</td>
<td>5 V output</td>
<td>Remove resistor</td>
<td>3.3 V / 3.3 V</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1.8 V ~ 3.6 V</td>
<td>-</td>
<td>-</td>
<td>Connect to PC</td>
<td>OFF</td>
<td>DC Input 1.8 V ~ 3.6 V</td>
<td>Remove resistor</td>
<td>1.8 V / 3.3 V</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1.8 V ~ 3.6 V</td>
<td>-</td>
<td>-</td>
<td>Nu-Link2-Me removed</td>
<td>OFF</td>
<td>DC Input 1.8 V ~ 3.6 V</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

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 3-12 Supply External Power for NUC029 Target Board

3.5 Ammeter Connector

User can refer to the sample code in NUC029xAN 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 3-13 presents the ammeter connector.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMETER</td>
<td>Connector for user to measure the target chip power consumption easily. User needs to remove the R16 resistor.</td>
</tr>
</tbody>
</table>

Table 3-13 Ammeter Connector
3.6 Push Buttons

Table 3-14 presents the push buttons.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICESW1</td>
<td>Offline program button to start offline ICP programming the target chip.</td>
</tr>
<tr>
<td>SW1</td>
<td>Reset button to reset the target chip.</td>
</tr>
</tbody>
</table>

Table 3-14 Push Buttons
3.7 LEDs

Table 3-15 presents the LEDs.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power LED</td>
<td>The power LED indicates that the NuMaker-NUC029L is powered.</td>
</tr>
<tr>
<td>P3.6 LED</td>
<td>The LED is connected to the target chip P3.6.</td>
</tr>
<tr>
<td>ICES0, ICES1, ICES2 and ICES3</td>
<td>Nu-Link2-Me status LED.</td>
</tr>
</tbody>
</table>

Table 3-15 LEDs

3.8 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.

3.8.1 VCOM Switches

Table 3-16 presents how to set the VCOM function by ICESW2.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TXD</td>
<td>On: Connect target chip P3.1 (UART0_TXD) to Nu-Link2-Me.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off: Disconnect target chip P3.1 (UART0_TXD) to Nu-Link2-Me.</td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
<td>On: Connect target chip P3.0 (UART0_RXD) to Nu-Link2-Me.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off: Disconnect target chip P3.0 (UART0_RXD) to Nu-Link2-Me.</td>
</tr>
</tbody>
</table>

Note: Pin 3 and 4 is unused.

Table 3-16 VCOM Function of Nu-Link2-Me
### 3.8.2 Status LEDs

Table 3-15 presents the status LEDs patterns for different operation on Nu-Link2-Me.

<table>
<thead>
<tr>
<th>Operation Status</th>
<th>Status LED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICES0</td>
</tr>
<tr>
<td>Boot</td>
<td>Flash x 3</td>
</tr>
<tr>
<td>Idle</td>
<td>On</td>
</tr>
<tr>
<td>One Nu-Link2-Me is selected to connect</td>
<td>Flash x 3</td>
</tr>
<tr>
<td>ICE online (Not connected to a target chip)</td>
<td>On</td>
</tr>
<tr>
<td>ICE online (Connected to a target chip)</td>
<td>On</td>
</tr>
<tr>
<td>ICE online (Failed to connect to a target chip)</td>
<td>On</td>
</tr>
<tr>
<td>During offline programming</td>
<td>-</td>
</tr>
<tr>
<td>Offline programming completed</td>
<td>On</td>
</tr>
<tr>
<td>Offline programming completed (Auto mode)</td>
<td>On</td>
</tr>
<tr>
<td>Offline programming failed</td>
<td>On</td>
</tr>
</tbody>
</table>

**Note:** "Online" means Nu-Link2-Me is connected to ICP Programming Tool, IDE or NuTool.
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 M0/M23
- IAR EWARM
- NuEclipse GCC (for Windows)
- NuEclipse GCC (for Linux)

4.2 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 4-1 and Figure 4-2.

Figure 4-1 Nu-Link USB Driver Installation Setup
Figure 4-2 Nu-Link USB Driver Installation
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 4-3 Open VCOM Function](image)

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

![Figure 4-4 ICE USB Connector](image)
3. Find the “Nuvoton Virtual COM Port” on the Device Manger as Figure 4-5.

![Device Manger](image)

**Figure 4-5 Device Manger**

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

![PuTTY Session Setting](image)

**Figure 4-6 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 4-7.

![Figure 4-7 Template Project Folder Path](image)

4.6 Execute the Project under Toolchains

Open and execute the project under the toolchain. The section 4.6.1, 4.6.2, and 4.6.3 describe the steps of executing project in Keil MDK, IAR EWARM and NuEclipse, 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 4-8 Warning Message of “Device not found”](image)

**Note:** If Figure 4-8 warning message jumps out, please migrate to version 5 format as shown in Figure 4-9. The “.uvproj” filename extension will change to “.uvprojx”.

Dec. 26, 2022 Page 29 of 46 Rev 1.00
2. Make sure the debugger is “Nuvoton Nu-Link Debugger” as shown in Figure 4-10 and Figure 4-11.

**Figure 4-10 Debugger Setting in Options Window**

*Note:* If the dropdown menu in Figure 4-10 does not contain “Nuvoton Nu-Link Debugger” item, please rework section 4.2.
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 4-12 Compile and Download the Project
4. Figure 4-13 shows the debug mode under Keil MDK. Click “Run” and the debug message will be printed out as shown in Figure 4-14. User can debug the project under debug mode by checking source code, assembly language, peripherals’ registers, and setting breakpoint, step run, value monitor, etc.

![Keil MDK Debug Mode](image1)

**Figure 4-13 Keil MDK Debug Mode**

![Debug Message on Serial Port Terminal Windows](image2)

**Figure 4-14 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 4-15.

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

1. Make
2. Successfully compile
3. Download and Debug

3. Make a target file as presented in Figure 4-16. After successfully compiling the project, download code to the Flash memory and enter debug mode.
4. Figure 4-17 shows the debug mode under IAR EWARM. Click “Go” and the debug message will be printed out as shown in Figure 4-18. User can debug the project under debug mode by checking source code, assembly language, peripherals’ registers, and setting breakpoint, step run, value monitor, etc.
4.6.3 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.

1. Double-click “NuEclipse.exe” to open the toolchain.
2. Import the “Template” project by following the steps presented in Figure 4-19 and Figure 4-20.
3. Click the “Template” project and find the project properties as shown in Figure 4-21. Make sure the settings are the same as settings in Figure 4-22.
4. Click the “Template” project and build the project.

![Figure 4-23 Build Project](image)

5. After the project is built, click the “Template” project and set the “Debug Configuration” as shown in Figure 4-24. Follow the settings presented in Figure 4-25, Figure 4-26 and Figure 4-27 to enter debug mode.

![Figure 4-24 Open Debug Configuration](image)
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 4-25 Main Tab Configuration

Figure 4-26 Debugger Tab Configuration
Note: User must follow those settings highlighted in green, and configure other settings depending on the needs.

Figure 4-27 Startup Tab Configuration
6. Figure 4-28 shows the debug mode under NuEclipse. Click “Resume” and the debug message will be printed out as shown in Figure 4-29. 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.
5 NUMAKER-NUC029L SCHEMATICS

5.1 Nu-Link2-Me

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

![Figure 5-1 Nu-Link2-Me Circuit](image-url)
5.2 NUC029 Target Board

Figure 5-2 shows the NUC029 target board circuit.

Figure 5-2 NUC029 Target Board Circuit
5.3 Extension Connectors

Figure 5-3 shows extension connectors of NuMaker-NUC029L.

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-NUC029L.
6 REVISION HISTORY

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022.12.26</td>
<td>1.00</td>
<td>Initial version.</td>
</tr>
</tbody>
</table>
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.