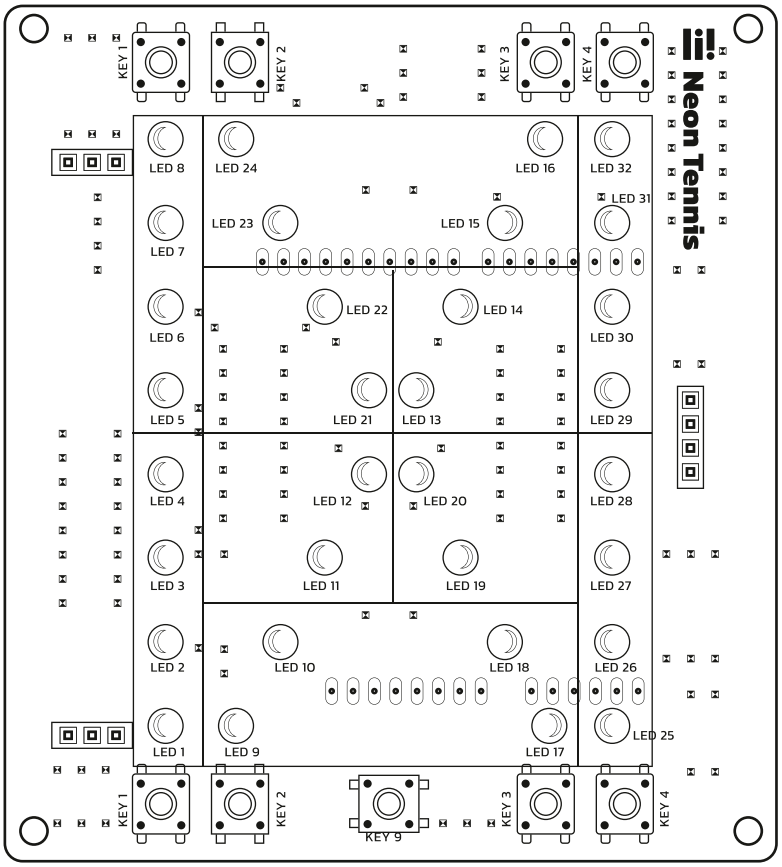
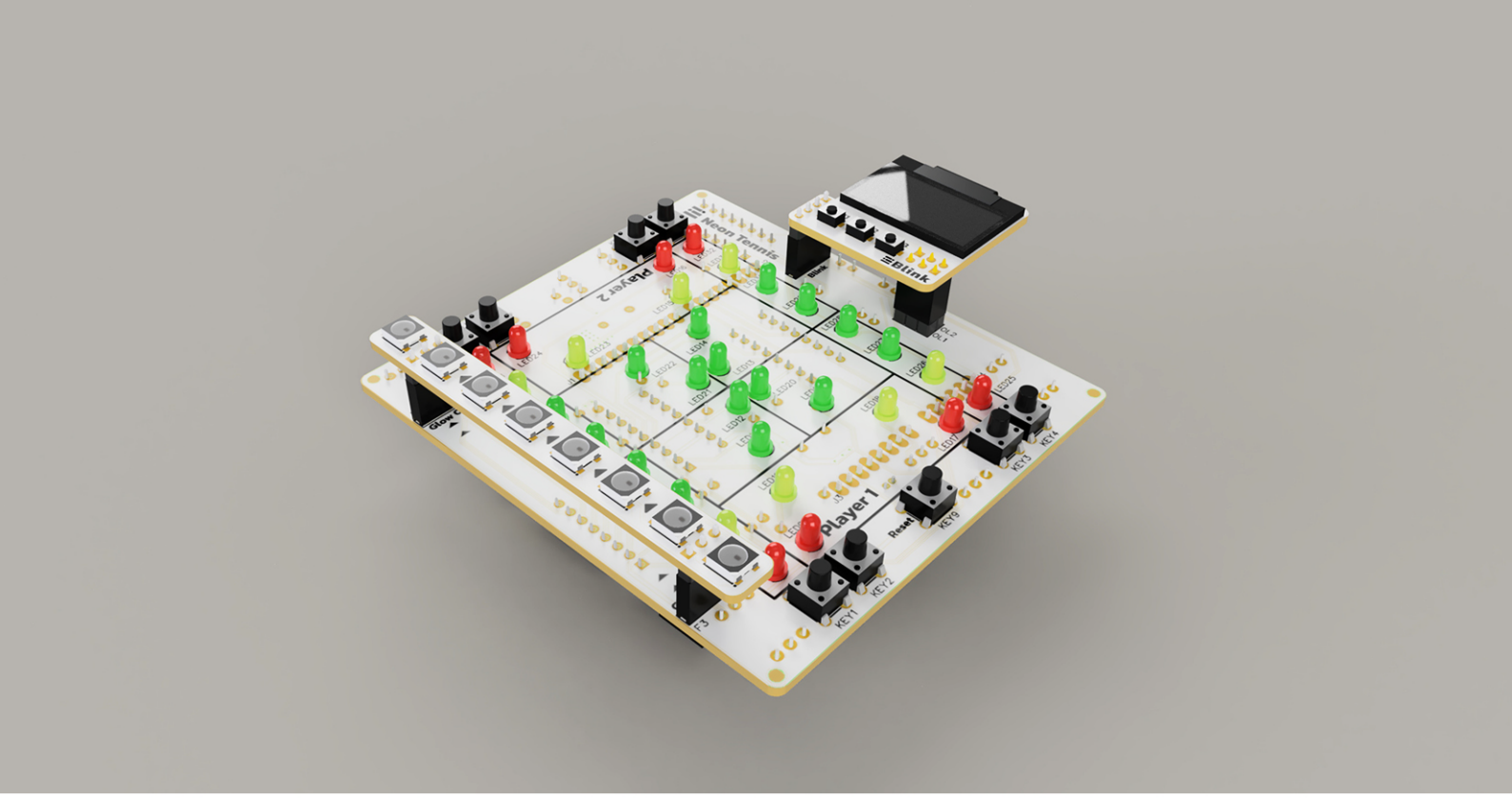
amomii



Neon Tennis

DATASHEET SKU : NT01V1S



Description

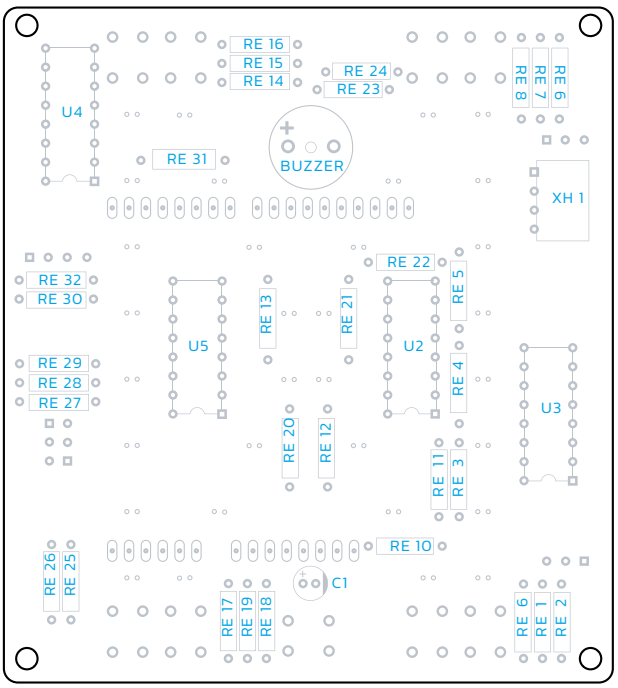
Neon Tennis is an Arduino-compatible game shield designed for two-player interactive gameplay. It features 32 LEDs arranged in specific lines to simulate a tennis court, allowing players to compete by hitting a virtual ball back and forth using buttons on the shield. The shield includes an OLED screen for displaying animations, scores, and game status, along with an RGB strip for visualizing serve power. Neon Tennis integrates electronics, programming, and gaming into an engaging and educational project suitable for makers of all skill levels.

This document outlines important technical data. For practical instructions on using Neon Tennis and understanding the game rules, please refer to the Getting Started manual.

Included Components

Label on the upper side of the PCB

Label on the under side of the PCB



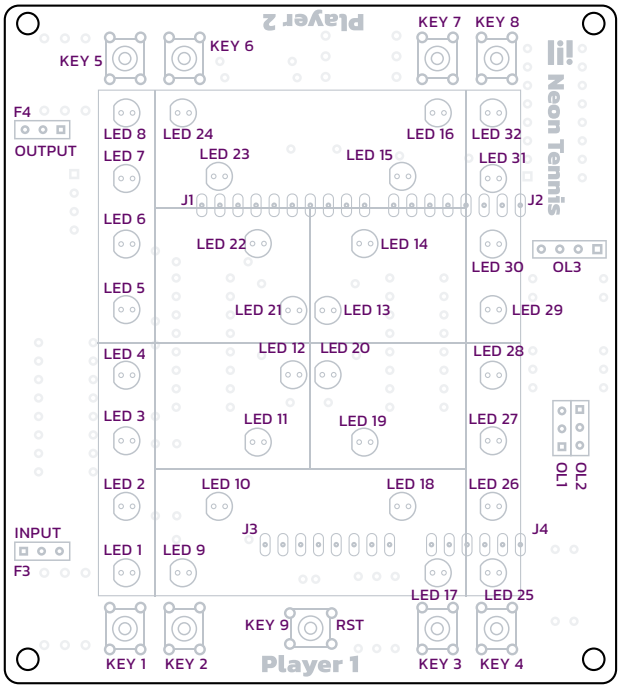
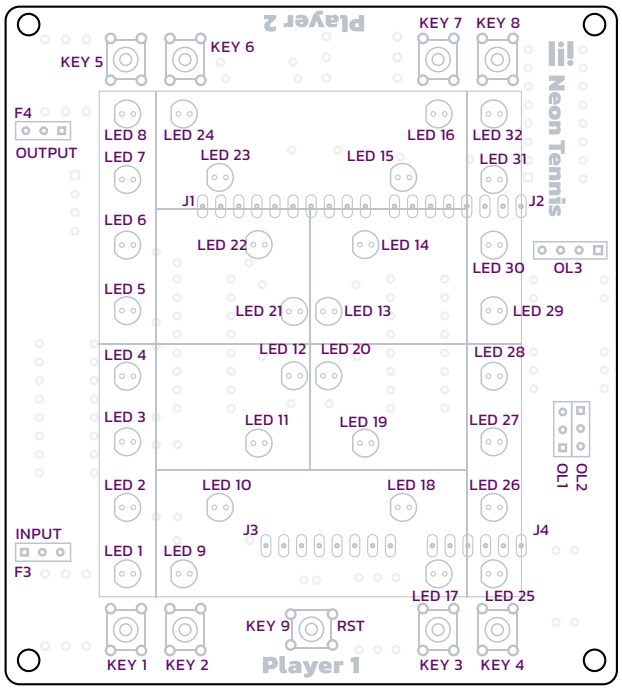
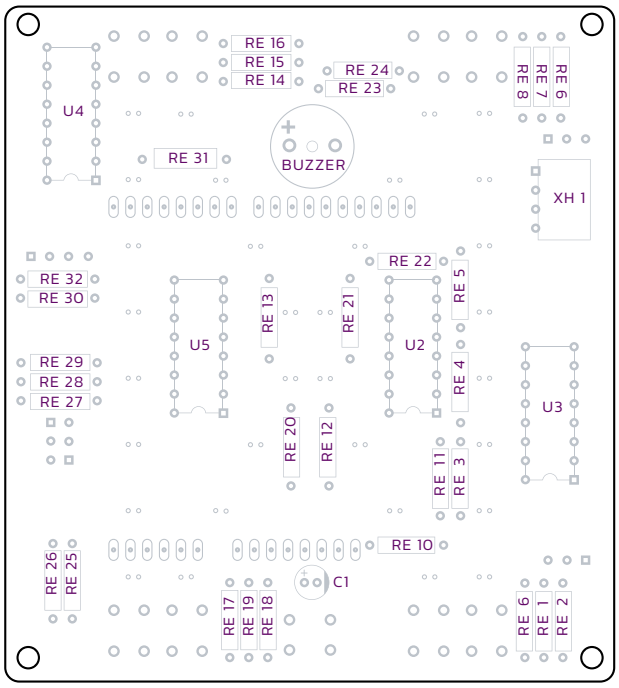


Image	Name	PCB Label	Datasheet
	amomii Blink	OL1, OL2, OL3	
	amomii Glow	Glow	
	XH Connector (4 Pin)	XH1	
	Electrolytic Capacitor (10uF 50V)	C1	
	Buzzer (Passive)	BUZZER	
	Male Header (40 Pin)	J1, J2, J3, J4, OL1, OL2	
	Female Header (4 Pin)	OL3	
	Female Header (3 Pin)	F3, F4	
	74HC595N Shift Register	U2, U3, U4, U5	
	Tactile Push Button (6x6xH7mm)	KEY1~KEY9	
	Red LED (3mm)	LED1, LED9, LED17, LED25, LED8, LED24, LED16, LED32	
	Yellow LED (3mm)	LED2, LED7, LED10, LED15, LED18, LED23, LED26, LED31	
	Green LED (3mm)	LED3, LED4, LED5, LED6, LED11, LED12, LED13, LED14, LED19, LED20, LED21, LED22, LED27, LED28, LED29, LED30	
	Resistor (220Ω)	REY1~REY32	

PCB Layout



Top



Bottom

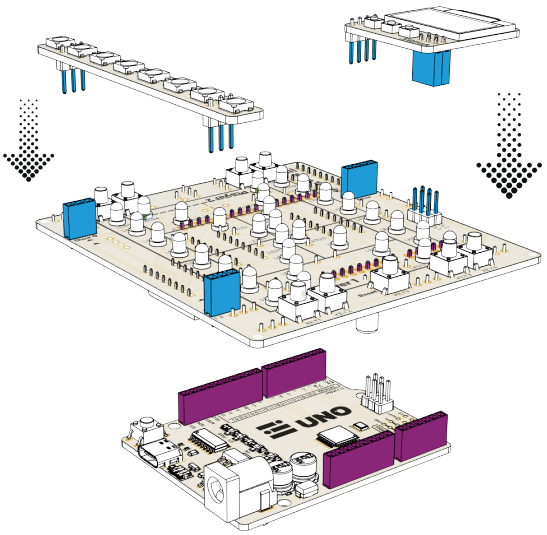
Power Consumption

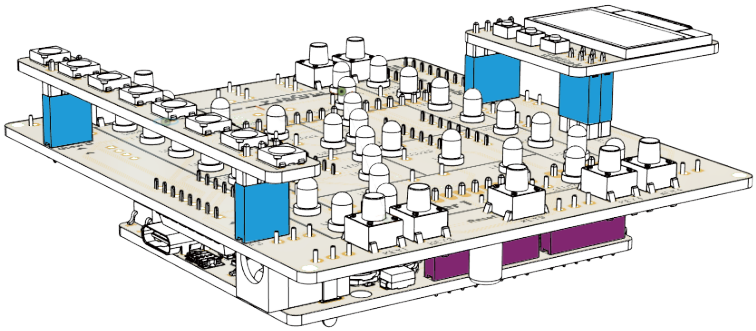
The Neon Tennis shield operates within specific power consumption parameters to ensure stable performance. While it can be powered through a computer's USB port, for optimal gameplay experience and to avoid potential performance issues due to power fluctuations, it is recommended to use a dedicated USB power plug, such as a phone charger or USB wall adapter.

Using a USB power plug ensures consistent power delivery, minimizing the risk of bugs or instability during gameplay sessions.

Microcontroller Connections

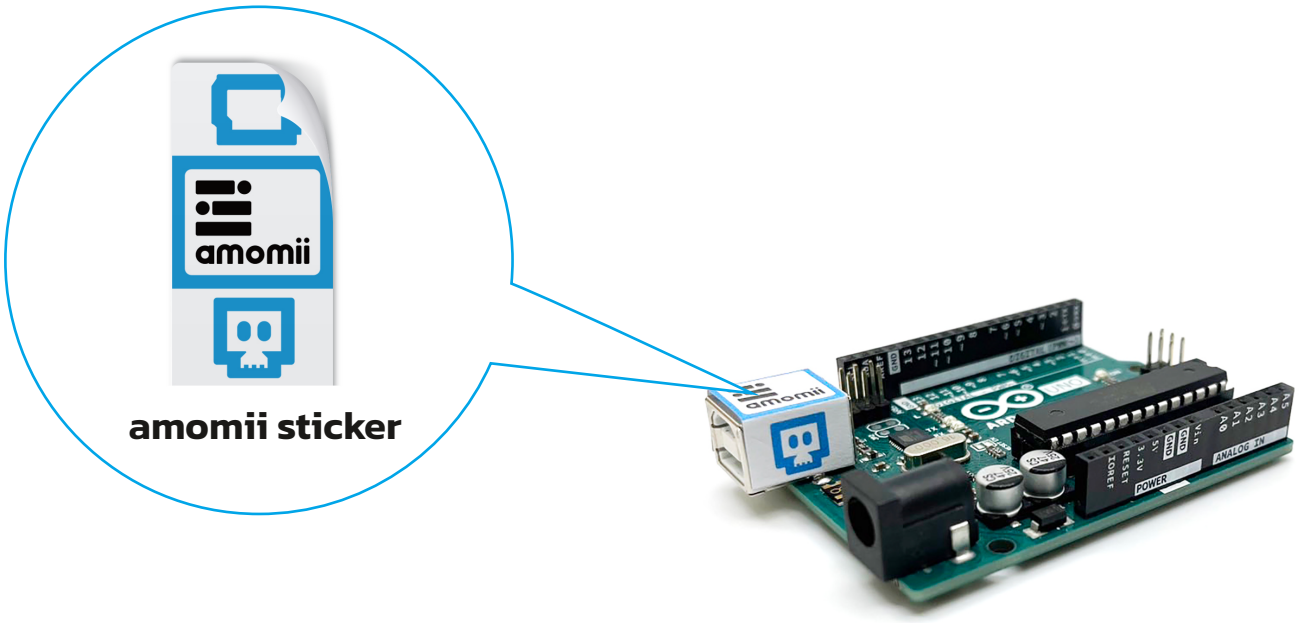
The Neon Tennis shield is specifically designed to connect seamlessly on the amomii UNO or any other microcontroller configured in the Arduino UNO style.





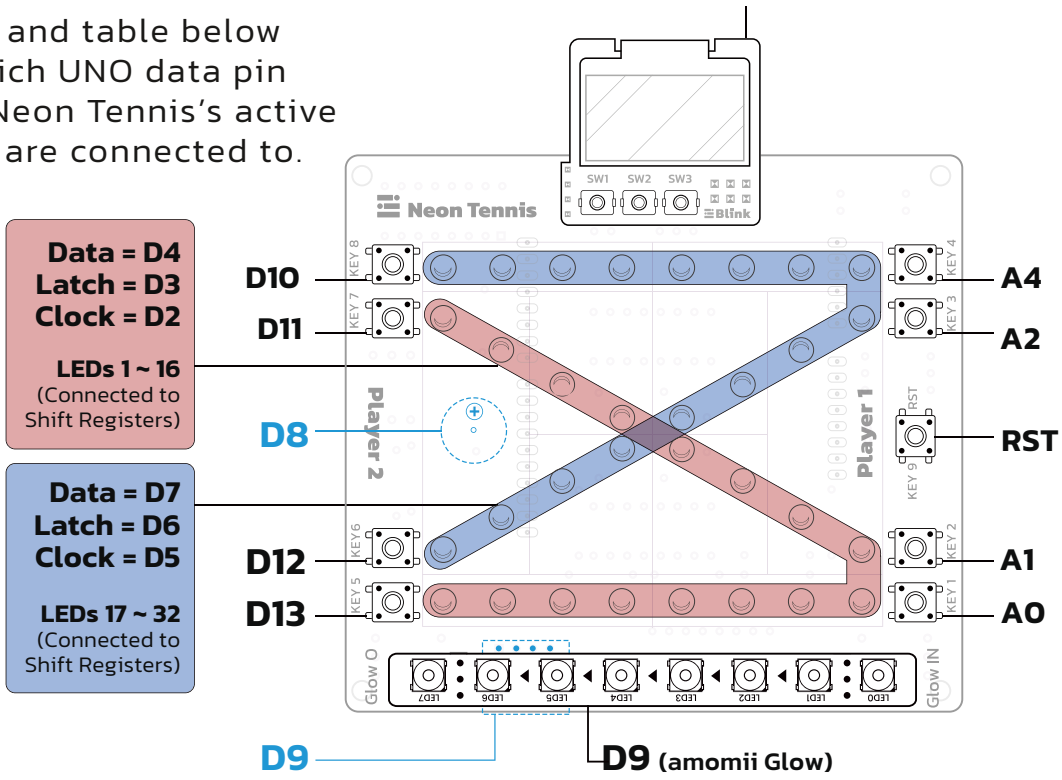
Warning:

LED 5 and LED 6 are located above the UNO board's USB port. If you are using an amomii UNO or any other UNO board with a USB-C port, this is not an issue. However, if you are using an UNO board with a USB-A port, such as the Arduino UNO R3, caution must be taken to ensure the LED legs don't make contact with the port. To prevent issues with performance, we advise users to cut the legs of LED 5 and LED 6 as close as possible to the PCB (without damaging the PCB), and then stick the included amomii sticker on top of the USB port as shown below.



Connection Diagram (Active Components)

The diagram and table below illustrate which UNO data pin each of the Neon Tennis's active components are connected to.



PCB Label	Component	UNO Data Pin
The following components are connected together and are controlled by the same UNO data pins. See the Circuitry Details section of more information		
U3 (LED1, LED2, LED3, LED4, LED5, LED6, LED7, LED8)	74HC595N Shift Register (LEDS 1 - 8)	Data = D4 Latch = D3 Clock = D2
U2 (LED9, LED10, LED11, LED12, LED13, LED14, LED15, LED16)	74HC595N Shift Register (LEDS 9 - 16)	
The following components are connected together and are controlled by the same UNO data pins. See the Circuitry Details section of more information		
U5 (LED17, LED18, LED19, LED20, LED21, LED22, LED23, LED24)	74HC595N Shift Register (LEDS 17- 24)	Data = D7 Latch = D6 Clock = D5
U4 (LED25, LED26, LED27, LED28, LED29, LED30, LED31, LED32)	74HC595N Shift Register (LEDS 25 - 32)	
KEY 1	Tactile Push Button	A0
KEY 2	Tactile Push Button	A1
KEY 3	Tactile Push Button	A2
KEY 4	Tactile Push Button	A4
KEY 5	Tactile Push Button	D13
KEY 6	Tactile Push Button	D12
KEY 7	Tactile Push Button	D11
KEY 8	Tactile Push Button	D10
KEY 9	Tactile Push Button	RST
BUZZER	Passive Buzzer	D8
GLOW IN	amomii Glow	D9
XH1	XH Connector (4 Pin)	D9
OL1, OL2, OL3	amomii Blink (OLED)	A4 and A5 (I2C Address 0x3C)

Circuitry Details

While some of the components are connected directly to the microcontroller in a conventional manner, others need more of an explanation.

Shift Register Connections for Controlling 32 LEDs

The Arduino UNO does not have enough I/O pins to directly control each LED individually. To solve this problem, shift registers are used, which allow multiple LEDs to be controlled with fewer pins by serially shifting data into the registers. The Neon Tennis shield uses four 74HC595N shift registers (labeled U2, U3, U4, and U5) to control the 32 LEDs.

In this group, U3 is connected directly to the Arduino UNO for data input. The data output from U3 is then connected to the data input of U2. This allows U3 to handle the first 8 LEDs, while U2 handles the next 8 LEDs.

Group 1: U3 and U2

- U3 (LED1 to LED8)
- U2 (LED9 to LED16)
- Connections:
  - Data = D4
  - Latch = D3
  - Clock = D2

Similarly, U5 is connected to the Arduino UNO for data input, and the data output from U5 is connected to the data input of U4. U5 controls LEDs 17 to 24, and U4 controls LEDs 25 to 32.

Group 2: U5 and U4

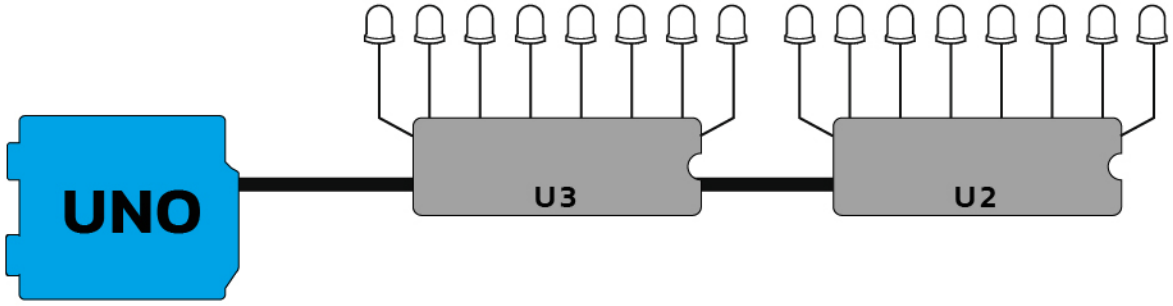
- U5 (LED17 to LED24)
- U4 (LED25 to LED32)
- Connections:
  - Data = D7
  - Latch = D6
  - Clock = D5

Working Principle

The shift registers control the LEDs by receiving and storing a sequence of bits from the Arduino.

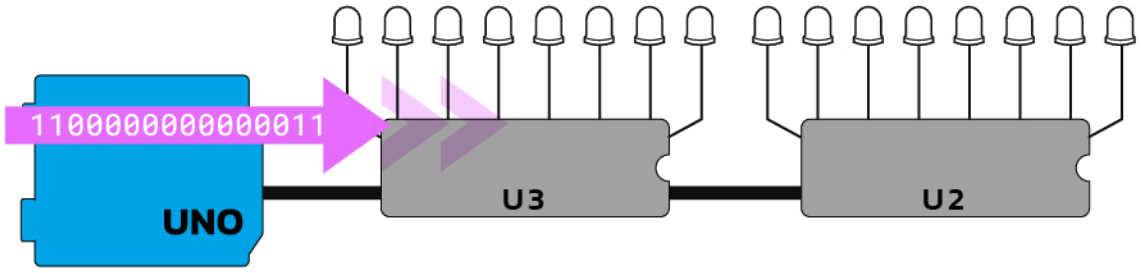
For example, if we have 16 LEDs in a row and want the first two and the last two LEDs to light up, this could be represented as the binary value `1100000000000011`, where `1` represents a glowing LED and `0` represents one that isn't. This 16-bit (2-byte) value is shifted from the UNO board to the shift registers and then displayed by the LEDs.

The simplified diagram represents LEDs 1-16 connected in a straight line, with LEDs 9-16 connected to shift register U2 and LEDs 1-8 connected to shift register U3.



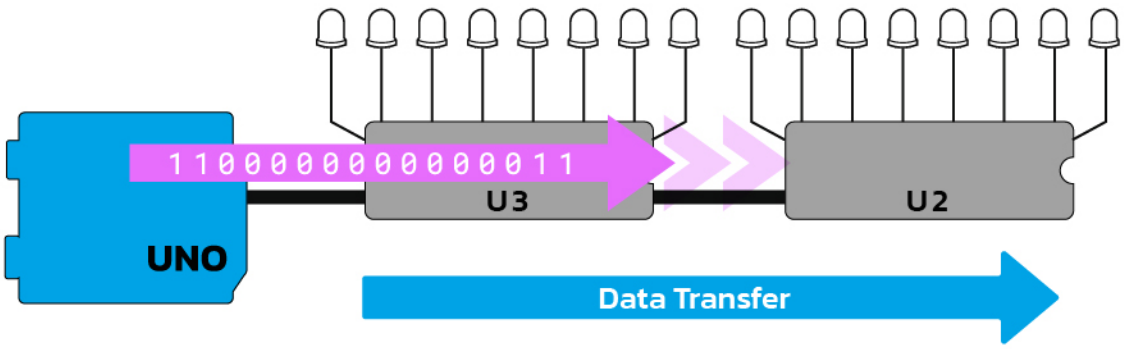
1. Data Transmission:

- The Arduino sends a sequence of bits (0s and 1s) to the shift register through the data pin.
- Each bit represents the state of an LED: 0 means the LED is off, and 1 means the LED is on.



2. Clock Signal:

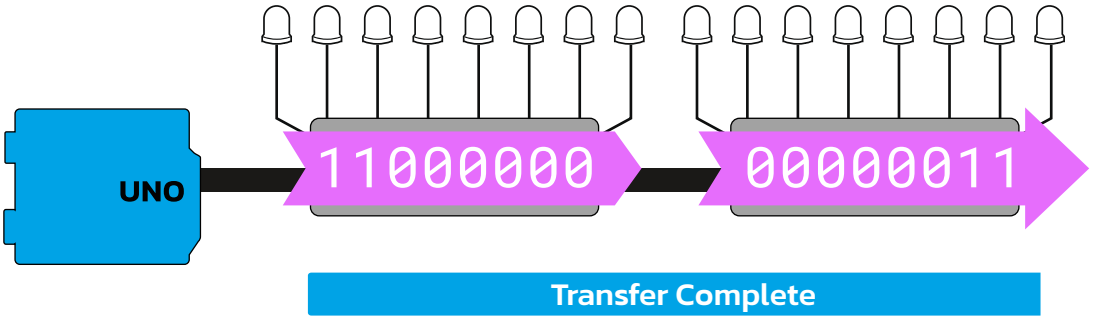
- The clock pin on the shift register is used to synchronize the transmission of each bit.
- For each clock pulse, one bit is transferred from the Arduino to the shift register.



3. Data Propagation:

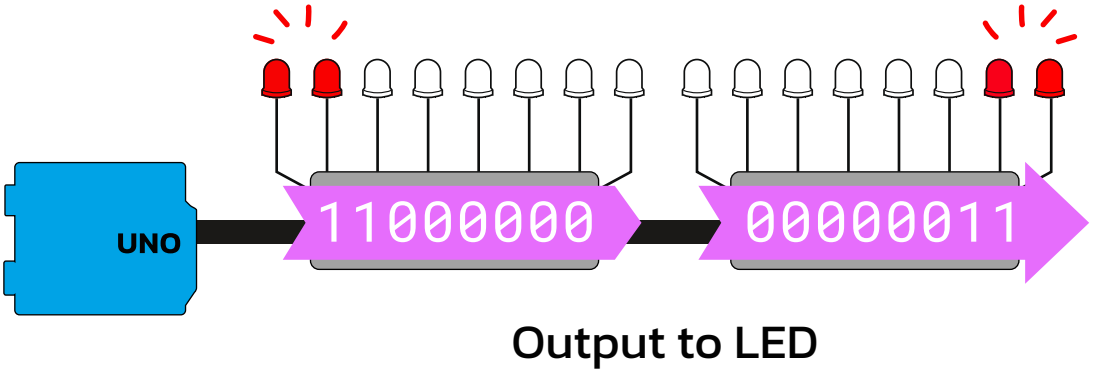
- The first bit sent from the Arduino enters the first stage of the shift register.

  With each subsequent clock pulse, the bits shift one position down the register.
- Once U3 receives 8 bits (for LEDs 1-8), the next bits propagate from U3 to U2, filling the positions for LEDs 9-16.



4. Latch Signal:

- After all the bits have been transmitted, the latch pin is activated.
- The latch signal tells the shift register to output the stored bits to the corresponding LEDs.
- This updates the state of each LED according to the received bits.



5. Repeat for Group 2:

- The same process is repeated for U5 and U4, using their respective data, clock, and latch pins.
- Data is first sent to U5 (LEDs 17-24) and then propagated to U4 (LEDs 25-32).

Tactile Push Button

While the buttons (KEY 1 - KEY 8) are connected directly to the UNO data pins as shown in the connection diagram, it should be noted that pulldown resistors are not used. Instead, these buttons must be set as input pullups in the Arduino code to ensure they function correctly. This configuration ensures that the pins read a stable HIGH state when the buttons are not pressed, and a LOW state when the buttons are pressed.

OLED Screen (amomii Blink)

The Neon Tennis shield features the amomii Blink module, an advanced OLED screen solution designed for seamless integration with Arduino UNO and compatible boards. This module offers a high-quality display and convenient user input through its built-in buttons.

Neon Tennis Wiring Overview:

- amomii Blink OLED Screen: The OLED screen is controlled via I2C, using the address 0x3C. It connects to the UNO's I2C pins (A4 for SDA and A5 for SCL).
- Buttons: The buttons on the amomii Blink module are not connected to the Neon Tennis game due to unavailable data pins on the UNO board; therefore, they are not used in the game.

For more information on the amomii Blink module, please see the amomii Blink datasheet.

See amomii Blink datasheet

amomii Glow

The amomii Glow is an addressable RGB light strip utilizing 8 WS2812B pixels. It is connected between female header pins F3 and F4. Proper orientation is crucial when connecting the Glow, with the arrows on the strip aligning with the arrows on the board. These arrows indicate the direction of data flow, from the input side of the strip to the output.

For more information on the amomii Glow, please refer to the **amomii Glow datasheet.**

amomii Glow UNO

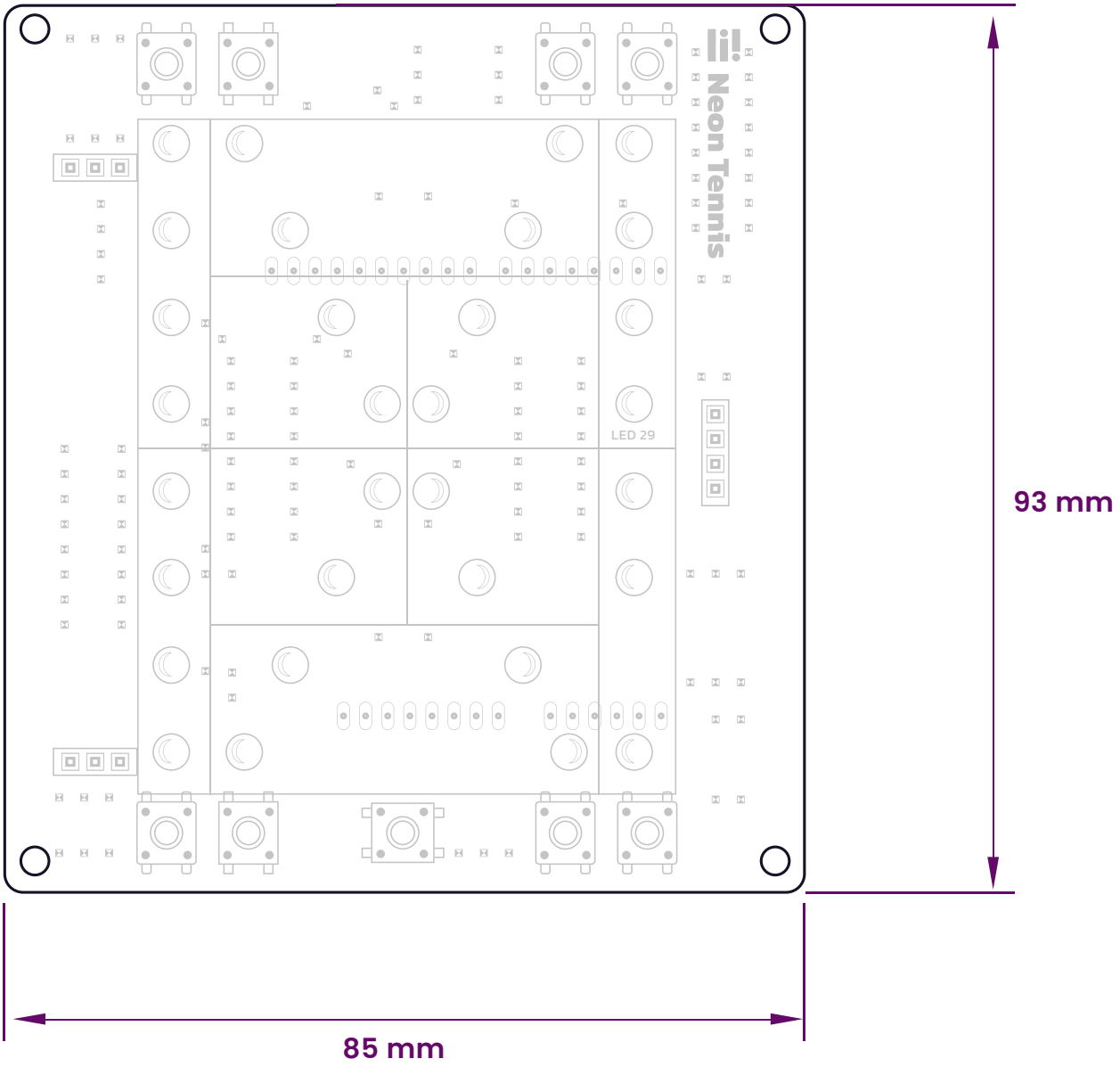
Although the amomii Glow UNO is not included with the Neon Tennis shield, it can be connected via the XH connector on the bottom of the board (XH1). To use the amomii Glow UNO, users must disconnect the amomii Glow. When the Glow UNO is connected, users can customize and create dynamic lighting effects that enhance the gaming experience.

Refer to the amomii Glow UNO datasheet for detailed instructions on configuration and programming.

Getting Started Guide

See Neon Tennis Getting Started

Board Dimensions



Revision History

Date	Revision	Changes
July. 01. 2024	1	First release

WEBSITE amomii.com

EMAIL info@amomii.com