Description

The UNIT JUN R3 is a multifunctional and flexible development board based on the reliable ATmega328P microprocessor. Completely compatible with the UNO-style form factor, it has contemporary improvements including an inbuilt 5×5 NeoPixel RGB LED matrix, USB-C connection, and a JST 1.0 mm 4-pin extension connector compatible with STEMMA QT and Qwiic® ecosystems.

UNIT JUN R3
Rev1.0

License MIT

Key Features

- Microcontroller: ATmega328P (8-bit AVR)
- Memory: 32 KB Flash, 2 KB SRAM, 1 KB EEPROM
- Clock Speed: 16 MHz
- Power Supply: USB-C (5 V) or external DC jack (7–20 V recommended)
- Interfaces: UART, I^2C, SPI, PWM, ADC, GPIO
- NeoPixel Matrix: Integrated 5×5 RGB LED Matrix (**WS2812b-1515**)
- Connectivity: USB-C for programming and power
- Form Factor: UNO-compatible (68.6 mm × 53.4 mm)
- Development IDEs: Arduino IDE, PlatformIO
- Onboard Features: NeoPixel matrix, user LED, reset button
- Expansion Connector: JST 1.0 mm 4-Pin (compatible with Qwiic®, STEMMA QT)

Typical Applications

- Prototyping: Rapidly build and evaluate embedded system concepts.
- Education: Ideal for teaching microcontroller fundamentals and electronics.
- Wearables: Compact form factor and flexible power options for portable devices.
- Interactive Displays: Use the integrated NeoPixel matrix for dynamic visual feedback.

Peripherals

Timers/Counters

- 2 × 8-bit Timer/Counter with period register and compare channels
- 1 × 16-bit Timer/Counter with period register, input capture, and compare channels

Communication Interfaces

- 1 × USART with fractional baud rate generator and start-of-frame detection
- 1 × SPI controller/peripheral
- 1 × I^2C controller/peripheral (dual mode)

Analog Features

- 1 × Analog Comparator (AC) with scalable reference input

System Features

- Watchdog Timer with independent on-chip oscillator
- Six PWM channels
- Interrupt and wake-up capability on pin change

Board Operation

Power Supply Options

- Operates from USB-C (5 V) supply.
- Absolute maximum external input: **20 V**
- Onboard regulator provides stable 3.3 V / 5 V rails for peripherals.
- AVCC pin supplies the analog circuitry (ADC, comparator).

Clock System

- Default clock: 16 MHz crystal oscillator.
- Optional internal oscillator can be used for low-power applications.

Reset Behavior

- Onboard reset button provides manual reset.
- Automatic reset during USB programming via DTR signal.

USB-C Interface

- Provides both programming interface and power input.
- Integrated USB-to-serial bridge for Arduino IDE compatibility.

NeoPixel Matrix Operation

- Integrated 5×5 WS2812b-1515 RGB LED matrix powered by VCC.
- Controlled via a dedicated digital pin D8.
- Requires sufficient current; recommended external supply for heavy use.

I/O Voltage Levels

- Digital I/O operates at 5 V logic (with 3.3 V tolerant inputs depending on board design).
- Analog reference selectable via AREF pin or internal reference.

Operating Conditions

- Typical operating voltage: 5 V
- Recommended temperature range: 0 °C to +70 °C.

Ratings

Power Consumption

Symbol	Description	Min	Typ	Max	Unit	Condition
V_IN max	Maximum input voltage (VIN pin/jack)	7	—	20	V	External DC jack input
V_USB max	Maximum input voltage (USB-C port)	—	—	5.5	V	USB-C connector
I_max	Maximum output current (board level)	1.7	2	2.1	A	Total delivery
I_3V3	Current available at 3.3 V rail	—	600	—	mA	Regulator output
IOH Max	Output high current per GPIO	—	—	8	mA	At VDD – 0.4 V (VOH)
IOL Max	Output low current per GPIO	—	—	8	mA	At VSS + 0.4 V (VOL)

DC Characteristics ATmega328

(TA = –40 °C to +125 °C, VCC = 2.7 V to 5.5 V)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Input low voltage (except XTAL1 and RESET)	VCC = 2.7 V to 5.5 V	VIL	–0.5	—	0.3 VCC	V
Input high voltage (except XTAL1 and RESET)	VCC = 2.7 V to 5.5 V	VIH	0.6 VCC	—	VCC + 0.5	V
Input low voltage (XTAL1 pin)	VCC = 2.7 V to 5.5 V	VIL1	–0.5	—	0.1 VCC	V
Input high voltage (XTAL1 pin)	VCC = 2.7 V to 5.5 V	VIH1	0.7 VCC	—	VCC + 0.5	V

Getting Started

1. **Power the Board**
   a. Connect the **UNIT JUN R3** to a computer using a **USB-C cable**.
   b. The board will power up automatically. The onboard LED will indicate activity.
2. **Install Software**
   a. Download and install the **Arduino IDE** (or PlatformIO).
   b. Ensure the **"Arduino UNO"** board profile is selected, as the UNIT JUN R3 is compatible with the ATmega328P core.
3. **Select Port and Board**
   a. In the Arduino IDE, go to **Tools → Board → Arduino UNO**.
   b. Under **Tools → Port**, select the COM/Serial port associated with the UNIT JUN R3.
4. **Upload Your First Program**
   a. Open the **Blink** example sketch (**File → Examples → 01.Basics → Blink**).
   b. Click **Upload** to program the board.
   c. The onboard LED (D13) should begin blinking if the upload is successful.
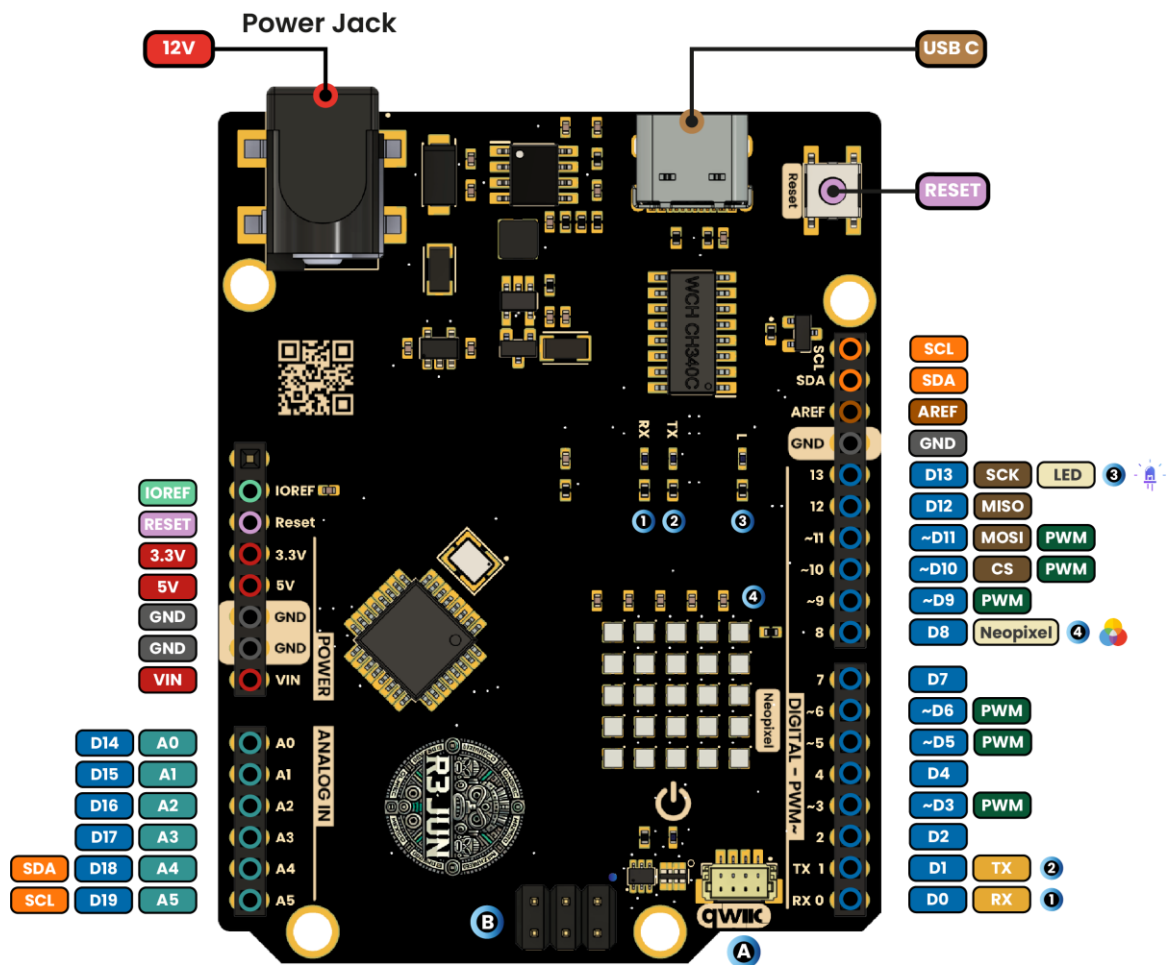5. **Explore Onboard Features**
   a. Try controlling the **5×5 NeoPixel matrix** (D8) with the Adafruit NeoPixel library.
   b. Experiment with the **user button and reset switch**.
   c. Use I^2C, SPI, UART, ADC, and GPIO pins for custom sensors and peripherals.

Pinout

PINOUT
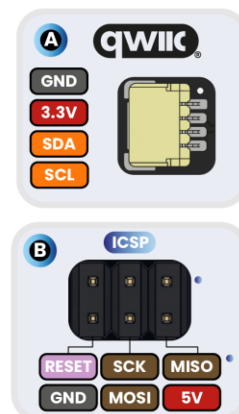# UNIT JUN R3

Top view

Description:

- 🟥 **VCC**
- ⬛ **GND**
- 🟪 **Reset**
- 🟦 **Analog pins**
- 🟦 **GPIO compatible with Arduino**
- 🟧 **I2C**
- 🟨 **UART**
- 🟫 **SPI**
- 🟩 **PWM**
- 🟫 **Analog reference**
- 🟩 **IO Reference**
- 🌈 **RGB**

Pin Distribution

Pin Label	Function / Notes
D0	RX – Serial Receive
D1	TX – Serial Transmit
D2	Digital I/O – Interrupt capable
D3	PWM – Pulse Width Modulation
D4	Digital I/O
D5	PWM – Pulse Width Modulation
D6	PWM – Pulse Width Modulation
D7	Digital I/O
D8	Digital I/O, Matrix 5x5 Pin Controller
D9	PWM – Pulse Width Modulation
D10	SPI CS – Chip Select
D11	SPI MOSI – Master Out Slave In
D12	SPI MISO – Master In Slave Out
D13	SPI SCK – Serial Clock
A0	Analog Input – 10-bit ADC
A1	Analog Input – 10-bit ADC
A2	Analog Input – 10-bit ADC
A3	Analog Input – 10-bit ADC
A4	I2C SDA – Serial Data Line
A5	I2C SCL – Serial Clock Line
VCC	Power Supply – 5V/3.3V (design)
GND	Ground – Common reference

Pin Classification Table
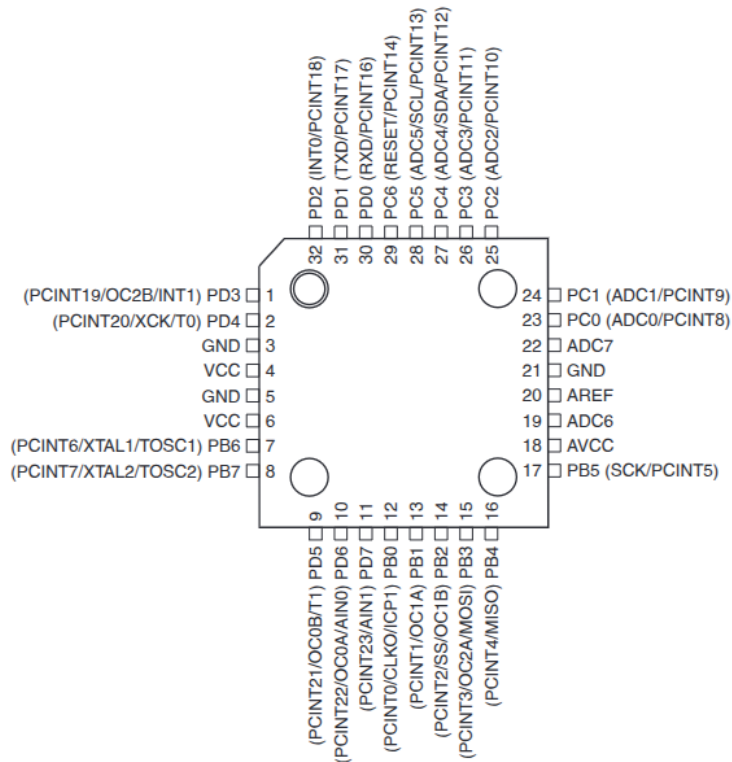
1. Digital I/O

Arduino Pin	Port Pin	Functionality
D0	PD0	UART RX
D1	PD1	UART TX
D2	PD2	Digital I/O, External Interrupt (INT0)
D3	PD3	Digital I/O, PWM, External Interrupt (INT1)
D4	PD4	Digital I/O
D5	PD5	Digital I/O, PWM
D6	PD6	Digital I/O, PWM
D7	PD7	Digital I/O
D8	PB0	Digital I/O
D9	PB1	Digital I/O, PWM
D10	PB2	Digital I/O, PWM, SS (SPI)
D11	PB3	Digital I/O, PWM, MOSI (SPI)
D12	PB4	Digital I/O, MISO (SPI)
D13	PB5	Digital I/O, SCK (SPI), Onboard LED

2. Analog Inputs

Arduino Pin	Port Pin	Functionality
A0	PC0	ADC0
A1	PC1	ADC1
A2	PC2	ADC2
A3	PC3	ADC3
A4	PC4	ADC4, SDA (I^2C)
A5	PC5	ADC5, SCL (I^2C)

3. SPI Pins

Arduino Pin	Port Pin	SPI Role
D10	PB2	SS
D11	PB3	MOSI
D12	PB4	MISO
D13	PB5	SCK

(Also available via ICSP header)

4. I2C Pins – JST Connector

Arduino Pin	Port Pin	I^2C Role
A4	PC4	SDA
A5	PC5	SCL

Board Topology
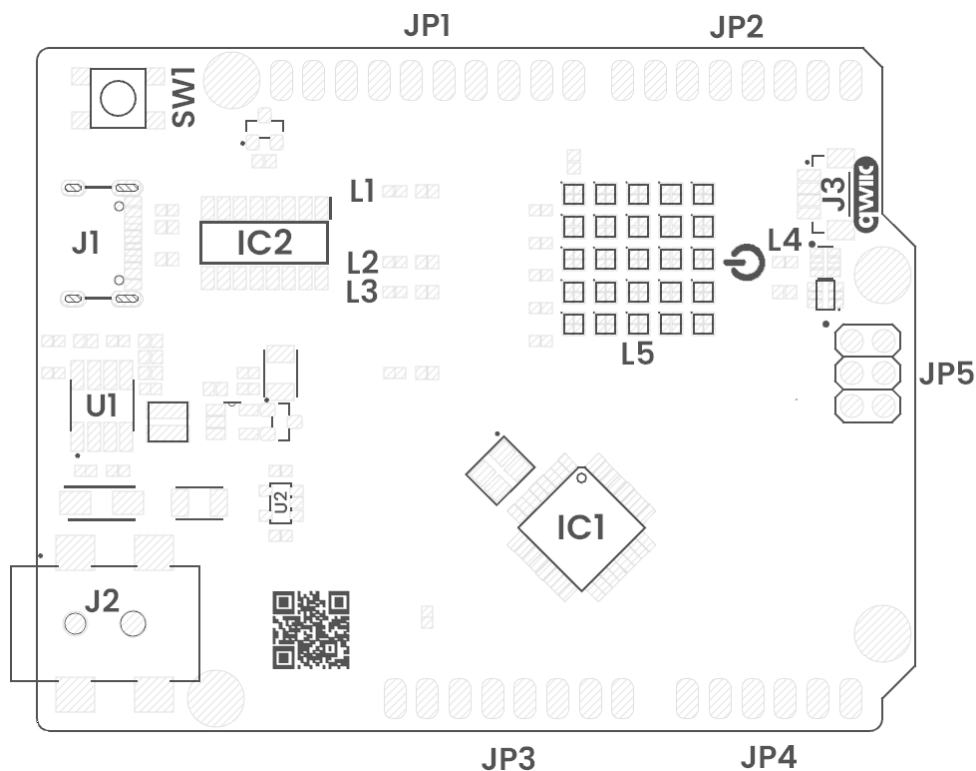
Ref.	Description
IC1	ATMEGA 328P Microcontroller
IC2	CH340 USB to Serial Controller
U1	MP1482 5V Step-Down Regulator
U2	AP2112K 3.3V Regulator
SW1	Reset Push Button
L1	Built-In LED
L2	Tx LED
L3	Rx LED
L4	Power On LED
L5	Neopixel Matrix
J1	USB Type-C Connector
J2	5mm DC Barrel Power Jack
J3	QWIIC Connector (JST 1mm)
JP1	Header for GPIOs
JP2	Header for GPIOs
JP3	Header for Power Supply and System Functions
JP4	Header for GPIOs (Analog)
JP5	Header for GPIOs (SPI)

Board Dimensions
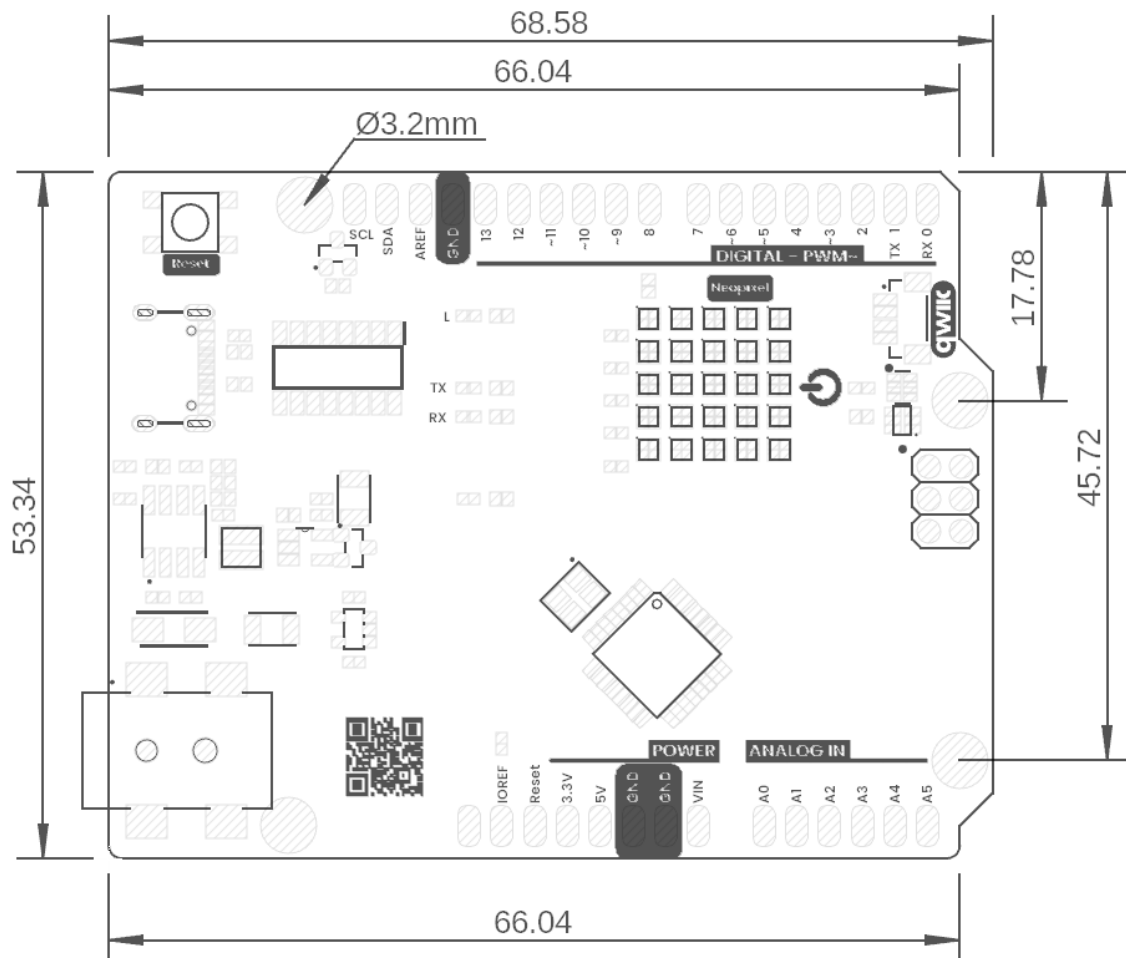
Company Information

Company name	**UNIT Electronics**
Company website	https://uelectronics.com/

Reference Documentation

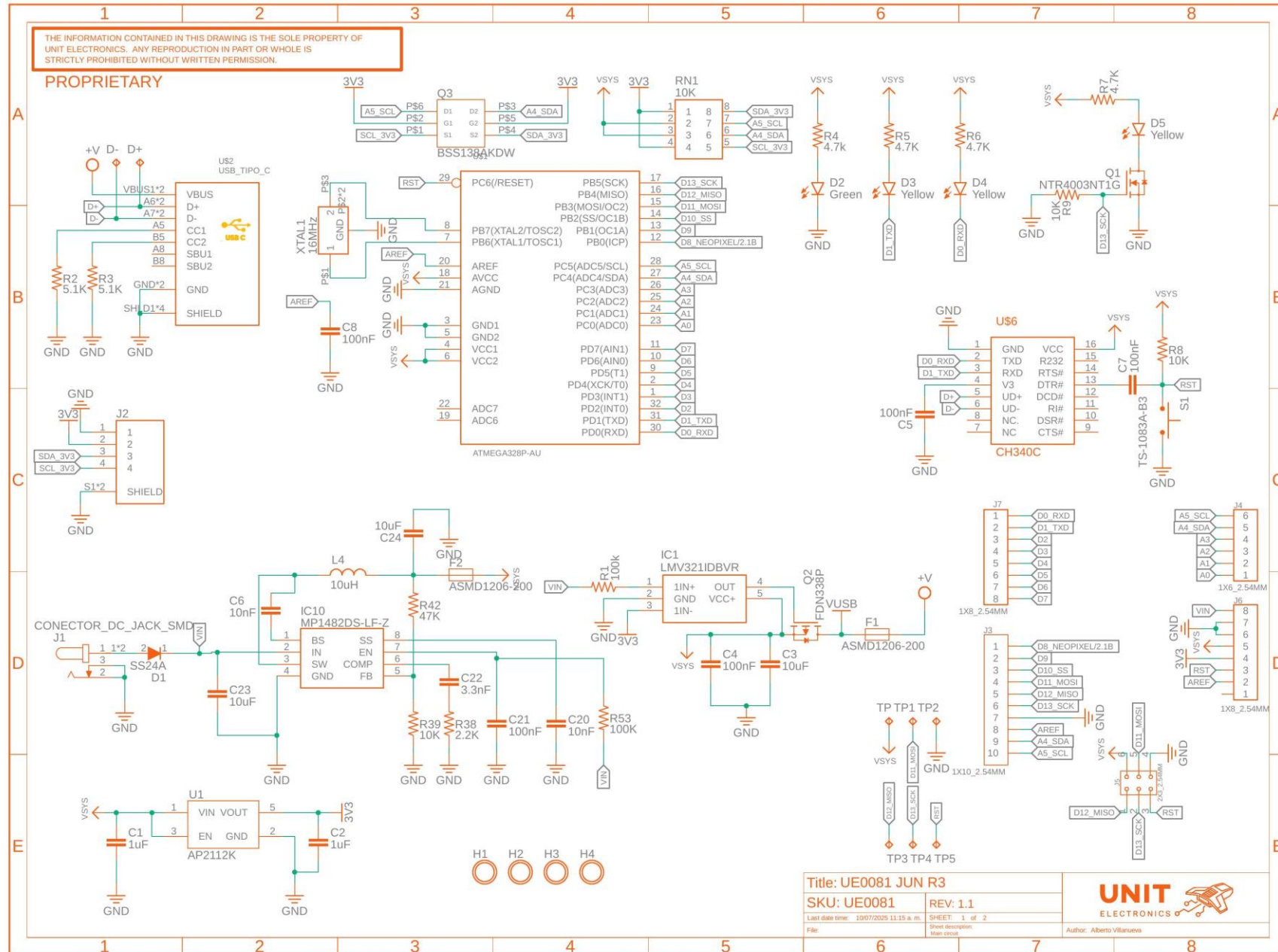| Ref.	Link
Github Documentation	https://github.com/UNIT-Electronics-MX/unit_jun_r3_development_board
Arduino IDE	https://www.arduino.cc/en/software
CH340 Driver	http://www.wch-ic.com/downloads/CH341SER_ZIP.html
Data Sheet	ATmega Data Sheet
Getting Started	Quick Start Guide

License

Title: UE0081 JUN R3		
SKU: UE0081	REV: 1.1	
Last date time: 10/07/2025 11:15 a. m.	SHEET: 1 of 2	
File:	Sheet description: Main circuit	Author: Alberto Villanueva

UNIT
ELECTRONICS

VSYS

GND

D8_NEOPIXEL/1.7D

R10 500

1uF C9
1uF C10
1uF C11
1uF C12
1uF C13

GND

LED	Part	Pins
LED1	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED2	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED3	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED4	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED5	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED6	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED7	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED8	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED9	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED10	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED11	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED12	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED13	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED14	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED15	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED16	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED17	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED18	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED19	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED20	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED21	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED22	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED23	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED24	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3
LED25	SK6805-EC15	P$1 P$2 DI GND VDD DO P$4 P$3