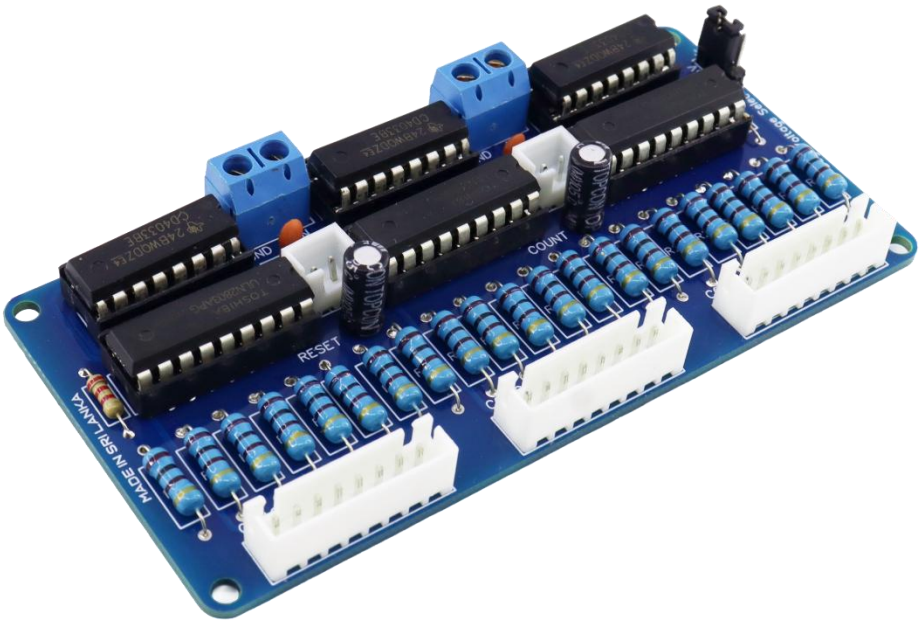

Patient Counter User Guide

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Introduction

The 3-Digit Digital Counter Circuit is an easy-to-use product that shows numbers from 000 to 999 on three 7-segment LED displays. It uses CD4033BE counter ICs to count each button press and a ULN2803A driver to power the displays safely. The circuit works with Common Anode (CA) 7-segment displays, giving clear and bright numbers. One push-button is used to increase the count, and another push-button is used to reset the display back to zero.

Key Features

- 3-digit display range (000–999) using cascaded CD4033 counters
- Manual push-button counting for simple user interaction
- Reset function to clear the counter instantly
- ULN2803A driver stage for safe current amplification and higher-voltage display support
- Common Anode (CA) 7-segment compatibility
- Current-limiting resistors to protect LED segments

Typical Applications

- Patient counters in hospitals, clinics, and diagnostic centers
- Queue management systems in healthcare and service facilities
- Visitor counters in offices or public institutions
- Event tally counters for monitoring attendance or participation

Working Principle

This circuit functions as a 3-digit digital counter that visually displays count values on 7-segment displays. The core of the system is built around CD4033BE decade counter ICs, which increment their count from 0 to 9 whenever the count push-button is pressed. Each CD4033 controls one digit of the display. When the button connected to CN4 is pressed, the IC advances its output and activates the corresponding segments (A–G) to form the correct numeral on the 7-segment display.

To drive the displays efficiently, specially when higher voltage is required, the segment outputs from each CD4033 are connected to a ULN2803A Darlington transistor array, which acts as a current amplifier. This allows the circuit to safely power the LED segments without overloading the CD4033 outputs. Each segment line includes a 100Ω resistor to limit current and protect the LEDs. Since the ULN2803A sinks current from the segment cathodes, the circuit is designed to work with Common Anode (CA) 7-segment displays, where all segment anodes are tied to the positive supply voltage.

The RESET (RST) push-button, connected to CN3, allows the counter to be reset to zero. To extend the counting range, three CD4033 ICs are cascaded: the first IC drives the units digit, its carry-out (CO) pin feeds the counter input of the second IC to drive the tens digit, and the second IC’s carry-out feeds the third

IC to drive the hundreds digit. This cascading arrangement enables the circuit to display counts from 000 to 999.

A 3V–5V power supply should be provided via CN2 to all ICs and display drivers. If a higher voltage is required for the displays, it can be supplied through the CN1 connector.

Circuit Diagram

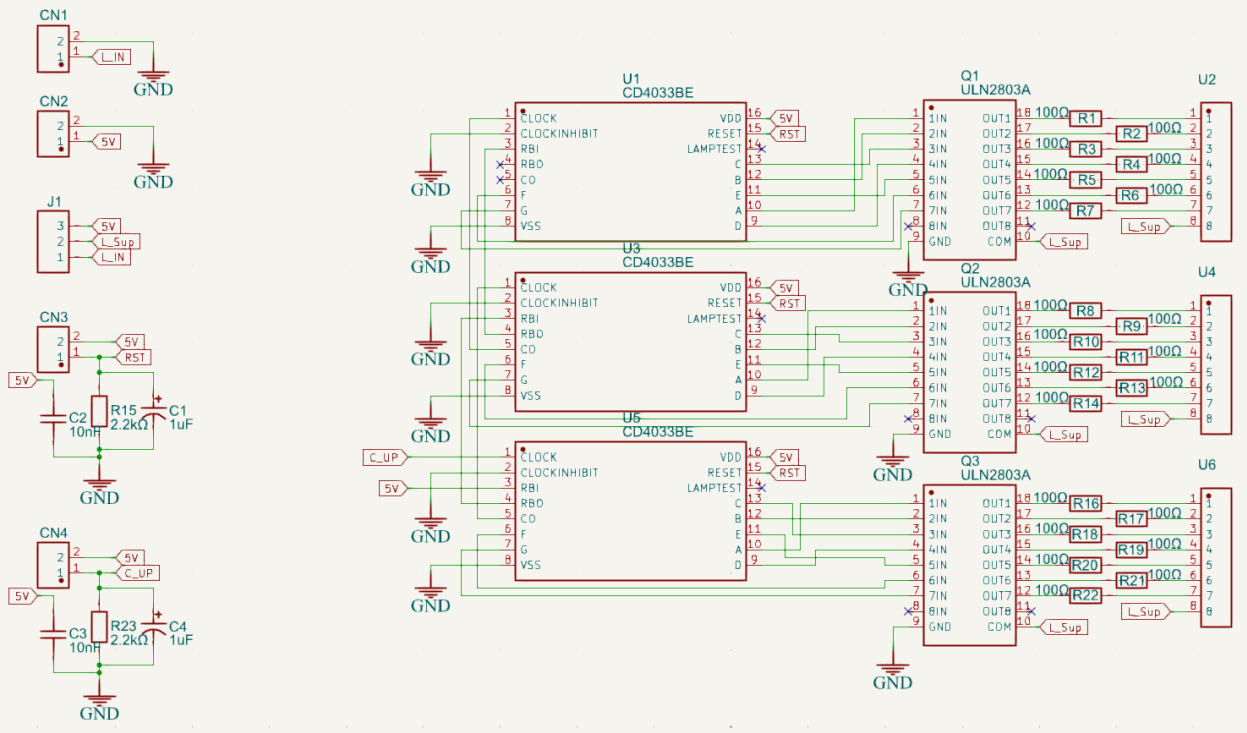


Figure 1 : Circuit diagram

Power Supply

Typical operating voltage: 3V – 5V

If the segment display requires a voltage higher than this range, connect the appropriate supply voltage through CN1.

Note:

- Even if a higher voltage is supplied to VIN of CN1, 3V to 5V should be supplied to CN2 because logic ICs operate within this range.
- The middle pin of the J1 header should be connected (via a jumper connector) either to 5V or to VIN, depending on the current requirement of the 7-segment displays.

- If 5V provides sufficient current for the displays, the middle pin should be connected to 5V. If VIN provides sufficient current for the displays, the middle pin should be connected to VIN using a jumper connector.

Connector Identification

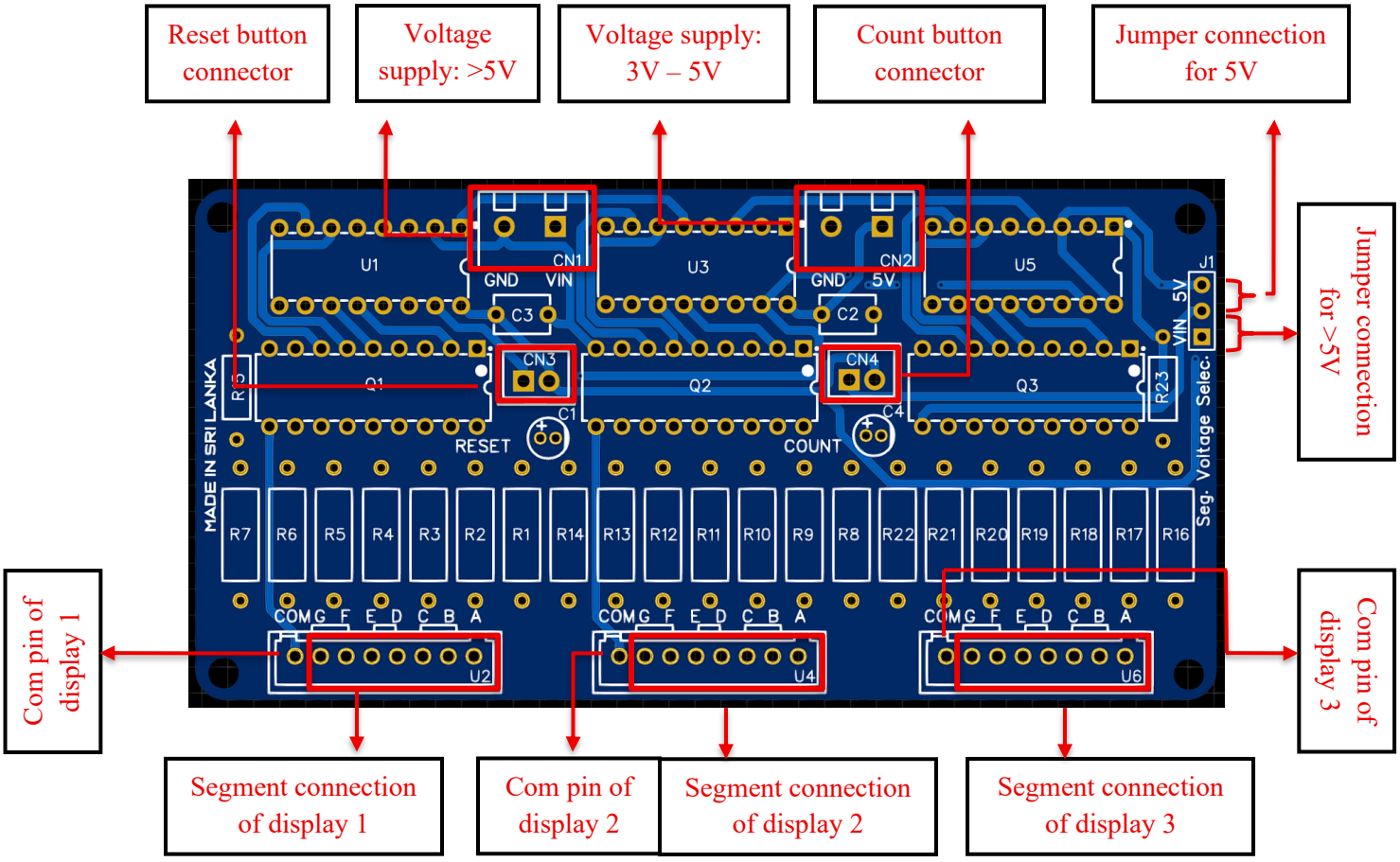
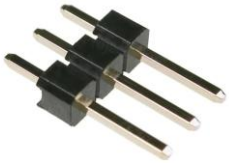
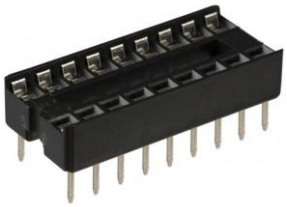


Figure 2 : Connector identification diagram

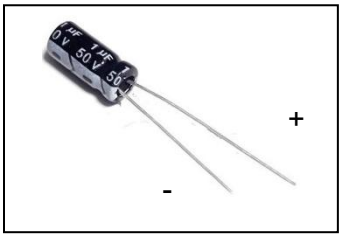
Note: If the segment pattern of the first 7-segment display is not shown correctly, swap the **F** and **G** segment connections for that display.

Required Components

Value	Designator	Quantity	Image
1uF	C1, C4	2	
10nF	C2, C3	2	
2 pin screw terminal	CN1, CN2	2	
2 pin connector	CN3, CN4	2	
Header	J1	1	
Jumper connector	-	1	

ULN2803A	Q1, Q2, Q3	3	
18 pin IC base	Q1, Q2, Q3	3	
100 Ohm	R1-R14, R16-R22	21	
2.2k	R15, R23	2	
CD4033BE	U1, U3, U5	3	
16 pin IC base	U1, U3, U5	3	
8 pin connector	U2, U4, U6	3	

Pin Assignments



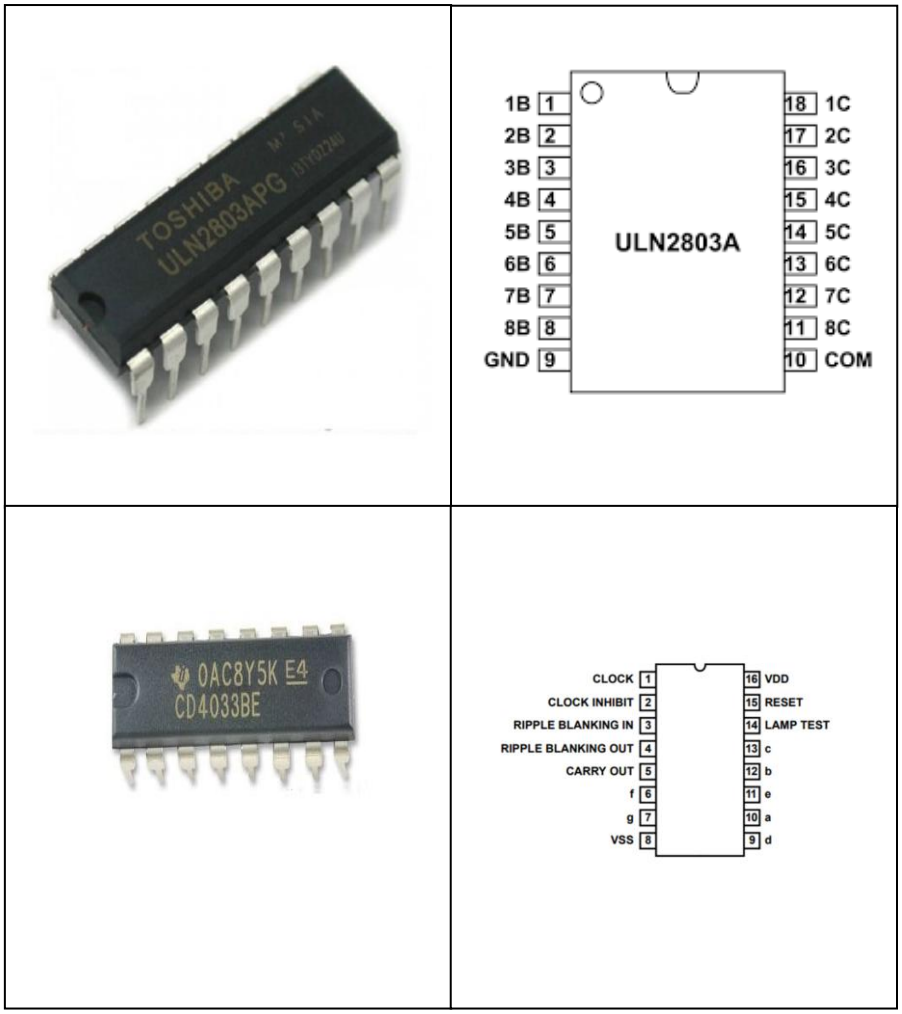


Figure 3 : Pin assignments

Components and Final Assembly

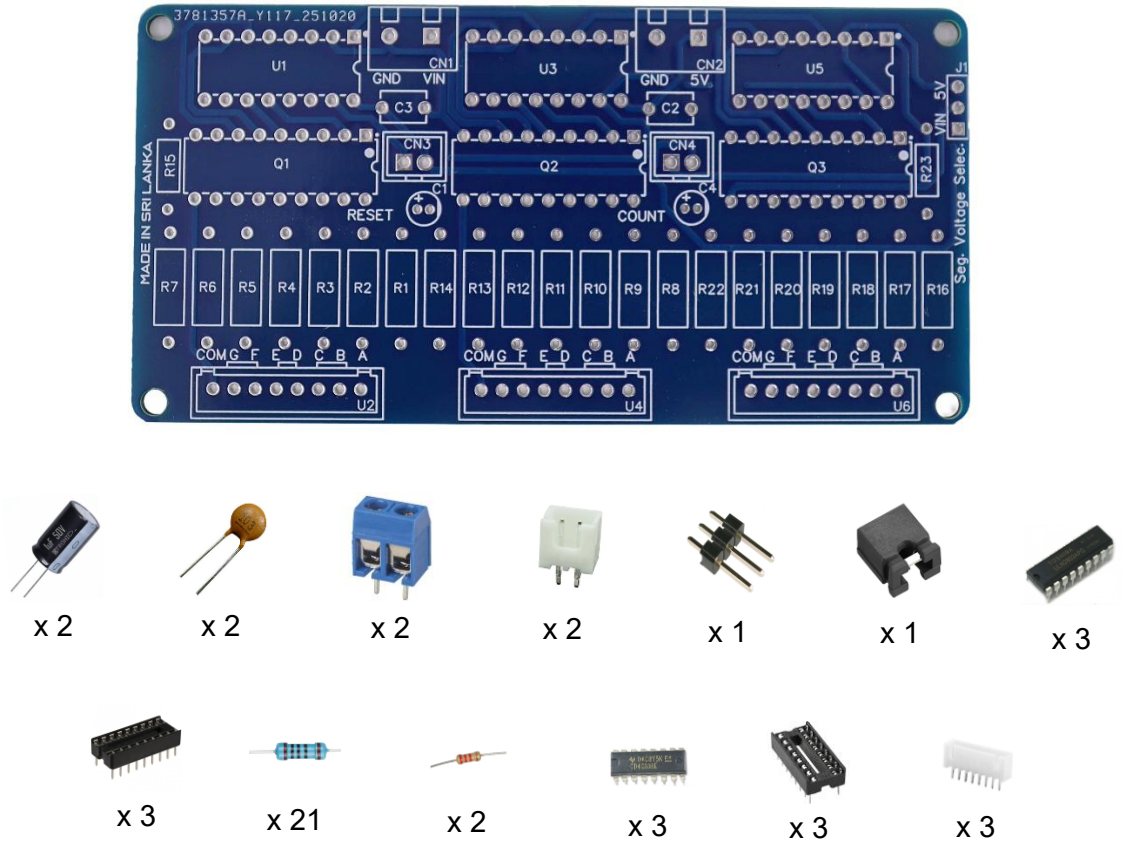


Figure 4 : PCB and required components

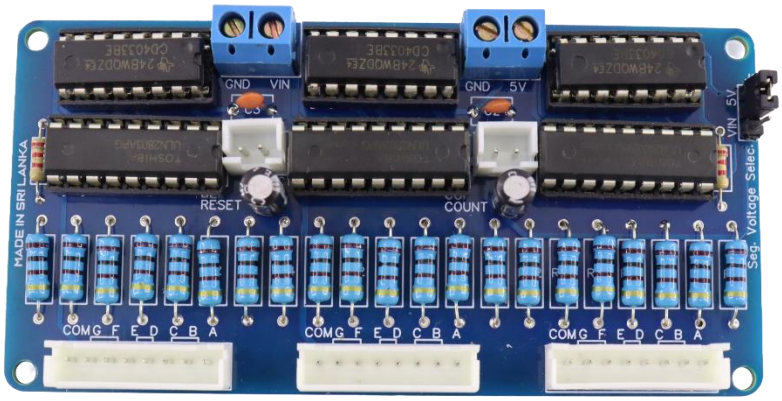


Figure 5 : Final assembly

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