



Really Large Size 7 Segment Display with SPI Interface - 8 Channel SPI Relay Board

This is an SPI Interface multichannel relay board for high voltage AC or low voltage DC loads. It is ideal for controlling LEDs lights, coffee machines, fans, pumps, or other high-voltage electrical appliances. The board also breaks out the SPI header, so controlling other boards is still possible. Each relay can handle current up to 7A @ 250V AC/30V DC. This 8 x channel board is mainly designed for AC loads, but it can also drive DC loads, screw terminals on each channel enable the easy interface of the AC load, and each point is marked as AC-Live and AC Neutral. Refer to the connection diagram for the interface. The project consists of 8 x 12V relays with load capacity 7A @ 250V AC, ULN2803 8 channel relay driver, 74HC595 SPI to 8 output, 5V regulator 7805, power LED, screw terminals for loads and AC input, header connector for SPI input and output.

SPI Interface: 6-pin header CN11 is provided for data input and CN10 connector is the SPI output that can be interfaced with multiple boards.

Note1: This board also can be used with direct 8 channel TTL inputs by not installing the 74HC595 chip, use CN12 connector for 8 TTL inputs, IN1, 1N2, 1N3, 1N4, IN5, IN6, IN7, IN8

Note 2: Each relay can drive a load of up to 7 A, but it is not advisable to use full current as PCB tracks can not handle 7 A x 8 Channel = 56Amps. The maximum advisable load on each channel is 1.2A, the total load on each channel is 1.2A x 230V = 276W maximum.

Controlling Large Size 7 Segment Display (Display size Approx. 8 Feet X 4 Feet)

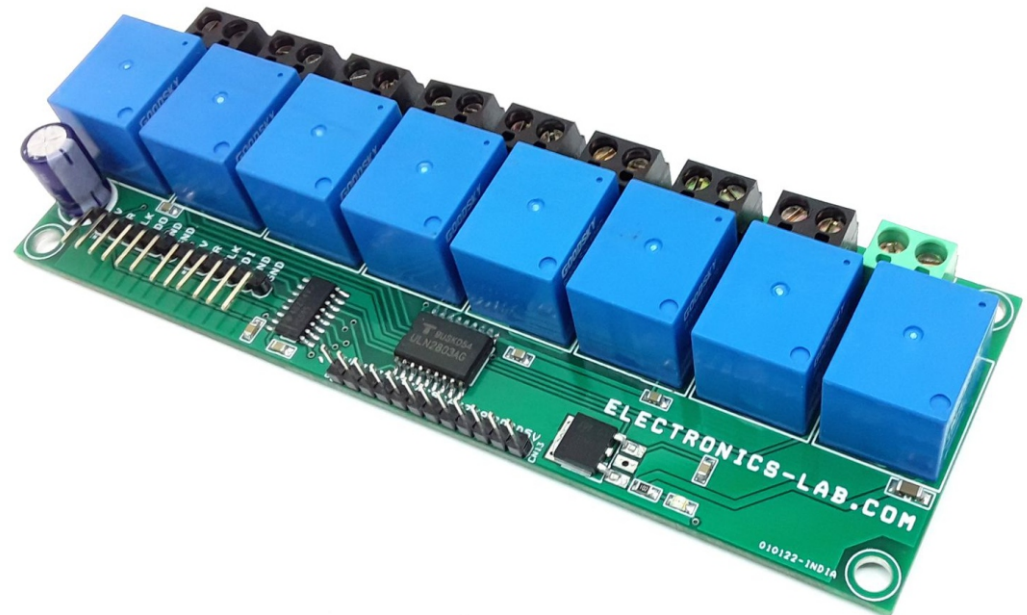
We have created and tested a large-size 7-segment display with this board and an Arduino. Arduino example code is available as a download. Wiring between Arduino vs SPI 8 channel board as follows:

- Pin 1: 5V DC Output (200mA Maximum) >> **Arduino 5V DC**
- Pin 2: SR/SRCLK/SH-CP (74HC595 Pin 11) >> **Arduino Digital Pin D13**
- Pin 3: RCLK/ST-CP (74HC595 Pin 12) >> **Arduino Digital Pin D12**
- Pin 4: SDI/DS/SER (74HC595 Pin 14) >> **Arduino Digital Pin D11**
- Pin 5: GND >> **Arduino GND**
- Pin 6: GND >> **Not Connected**

Arduino Code Credits: <http://www.learnerswings.com>

Each segment is made using 20W LED Batten (LED Tube Light) with Dimensions 113.5 x 2.8 x 6.8 cm, which works with 230V AC supply, user may use a smaller batten.

The project is tested with a single 7-segment display, but the user may use multiple displays with multiple boards, and use SPI outputs for other boards.





Connections for 7 Segments + DP

- CN2 Load 1 = Segment a
- CN3 Load 2 = Segment b
- CN4 Load 3 = Segment c
- CN5 Load 4 = Segment d
- CN6 Load 5 = Segment e
- CN7 Load 6 = Segment f
- CN8 Load 7 = Segment g
- CN9 Load 8 = Segment DP

SPI In CN11 Connections

- Pin 1: 5V DC Output (200mA Maximum)
- Pin 2: SR/SRCLK/SH-CP (74HC595 Pin 11)
- Pin 3: RCLK/ST-CP (74HC595 Pin 12)
- Pin 4: SDI/DS/SER (74HC595 Pin 14)
- Pin 5: GND
- Pin 6: GND

SPI Output CN10 Connections

- Pin 1: 5V DC Output (200mA Maximum)
- Pin 2: SR/SRCLK/SH-CP (74HC595 Pin 11)
- Pin 3: RCLK/ST-CP (74HC595 Pin 12)
- Pin 4: SDO (74HC595 Pin 9)
- Pin 5: GND
- Pin 6: GND

AC 230V Input CN1

- Pin 1 AC Live In
- Pin 2 AC Neutral In

AC Loads – 8 Channel (CN2, CN3, CN4, CN5, CN6, CN7, CN8, CN9)

- Pin 1 AC Live Output
- Pin 2 AC Neutral Output

Connector CN13

- Pin 1 5V DC Output Maximum Load 200mA
- Pin 2 GND

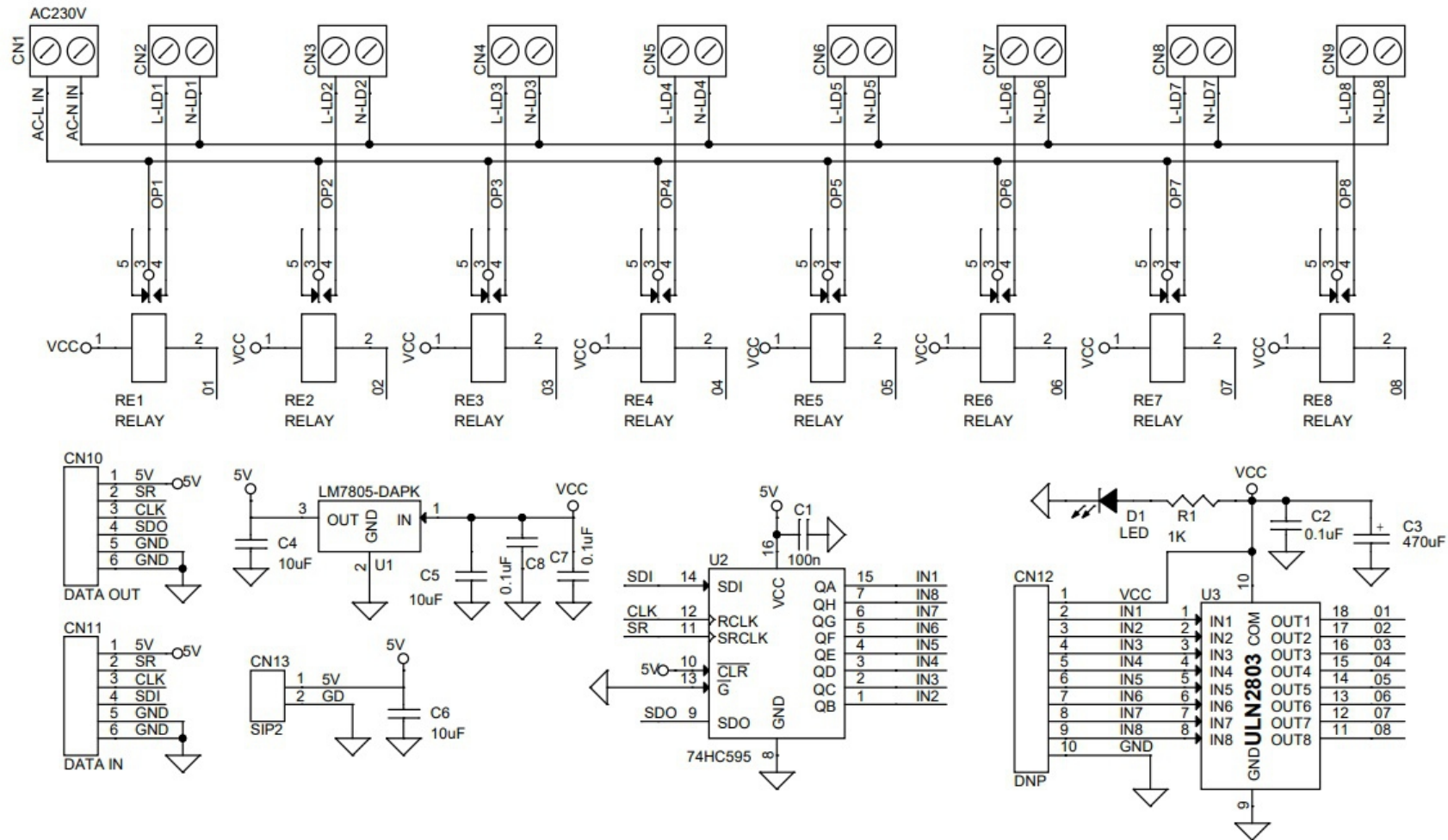
Power Supply Input – CN12

- Pin 1 VCC 12V DC (CN12)
- Pin 2 GND (CN12)

Connector CN12 (Optional Connector, do not Install read Note 1 for more info)



AC-N IN = AC 110V OR 230V NEUTRAL N-LD1 = LOAD 1 NEUTRAL CONNECTION
AC-L IN = AC 110V OR 230V LIVE L-LD1 = LOAD 1 LIVE CONNECTION

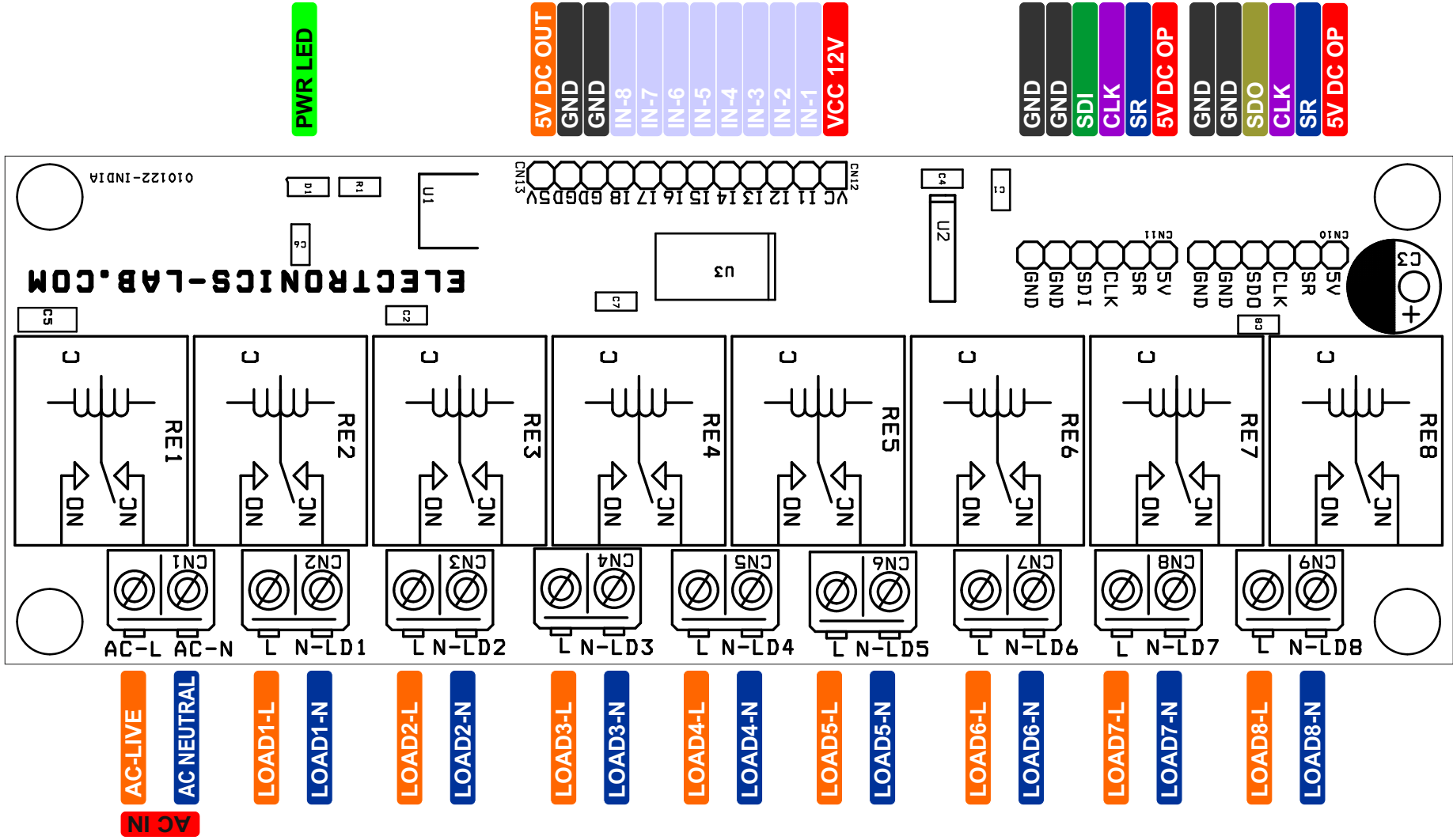


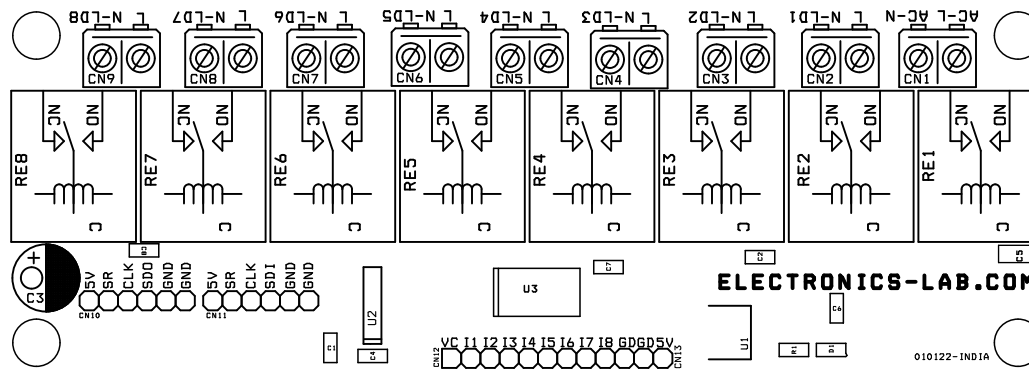
OP1 = SEGMENT A, OP2=SEGMENT B, OP3 SEGMENT =C, OP4 = SEGMENT D, OP5= SEGMENT E, OP6 = SEGMENT F, OP7 = SEGMENT G, OP8 = SEGMENT DP

Features

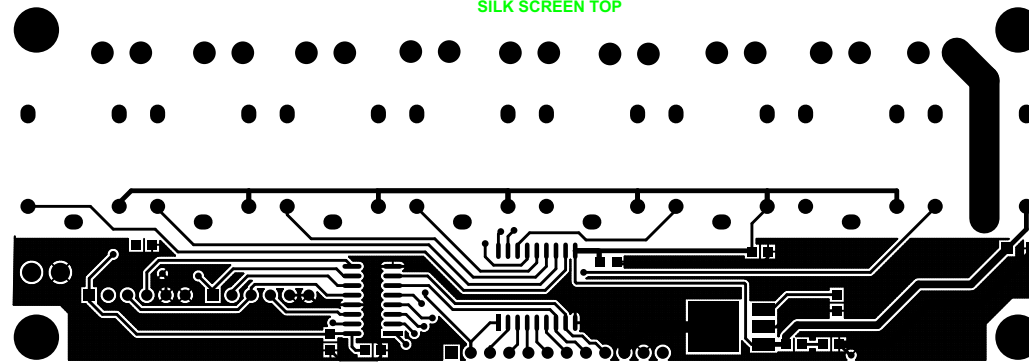
- Operating Supply 12V DC
- Current Consumption 400mA Approx. when All Relays ON (Each Relay 50mA)
- Easy SPI Interface using Header Connector
- SPI Output for Multiple board interface
- Power LED
- 8 Channel
- Screw Terminals for Loads and AC input
- 4 X 4.2MM Mounting Holes
- PCB Dimensions 137.16 x 47.94mm

BOM						
NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
2	8	CN2 - CN9	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
5	1	CN10	6 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5319-ND
6	1	CN11	6 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5319-ND
7	1	CN12	DNP			
8	1	CN13	2 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
10	5	C1,C2,C7,C8, C4	0.1uF/50V SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
11	1	C3	470uF/16V	PANASONIC	DIGIKEY	10-EEU-FM1C471LBCT-ND
12	1	C5	10uF/16V SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
13	1	D1	LED RED SMD SIZE 0805	LITE ON INC	DIGIKEY	160-1427-1-ND
14	8	RE1 - RE8	RELAY - 12V	TE CONNECTIVITY	DIGIKEY	PB2029-ND
15	1	R1	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
16	1	U1	LM7805-DAPK	TI	DIGIKEY	MC78M05CDTGOS-ND
17	1	U2	74HC595 SOIC16 NRW	FAIRCHILD	DIGIKEY	2156-MM74HC595SJ-ND
18	1	U3	ULN2803	TI	DIGIKEY	296-15777-1-ND
	1	C6	10uF/16V SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	

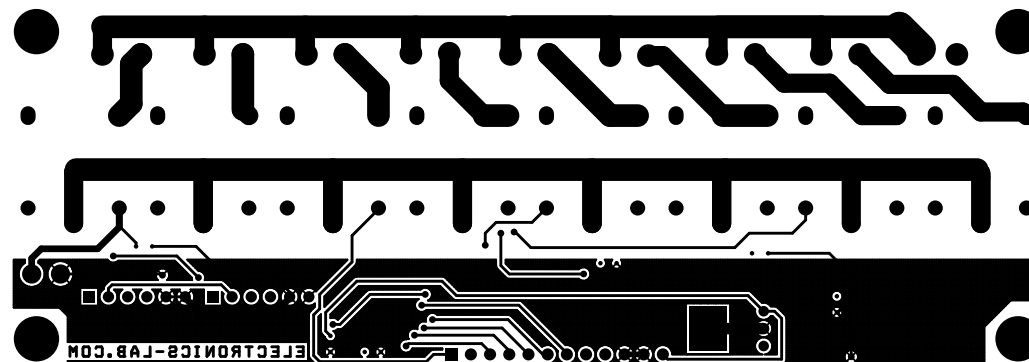




SILK SCREEN TOP



TOP LAYER



BOTTOM LAYER

PCB DIMENSIONS 137.16MM X 47.94MM

