MRCS Current Sink Driver (CSNK)

Revision 0.1 December 30, 2020

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Introduction

This document describes the CSNK and how to assemble and install it.

Revision History

v0.1   First Pass

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1 INTRODUCTION

The CSNK Version 2 connects to a cpNode, IOX16 or IOX32 and provides 16 high voltage/current outputs using the ULN2803 chip. Loads of up to 48 Volts and 0.5A may handled (but not all 16 at once!). Internal clamp diodes are provided for inductive loads. Outputs are on 0.100" centers and headers and screw terminals are available. The CSNK is ideal for situations where you need to drive high current devices (incandescent lamps) and inductive loads. CSNK offers compatibility with existing systems using 12V power for signals.

If you need to drive more than 0.5A, check out our [Sounder Driver](#) which can handle up to 10A (momentary) and provides a clamping diode.

The CSNK:

- uses standard semiconductors available from Jameco and similar suppliers
- Darlington active low output sinks up to 500mA at 48V

All components are through-hole technology for ease of assembly and repair.

All connection pads are standardized on .100" centers. This provides a wide range of interconnect options and components.   Connection schemes include screw terminal blocks, header pin connectors (male and female), soldered right angle headers, and direct soldered wires. Ground and Load Supply connections have parallel 3.5mm pads.

2   IDENTIFICATION AND INFORMATION
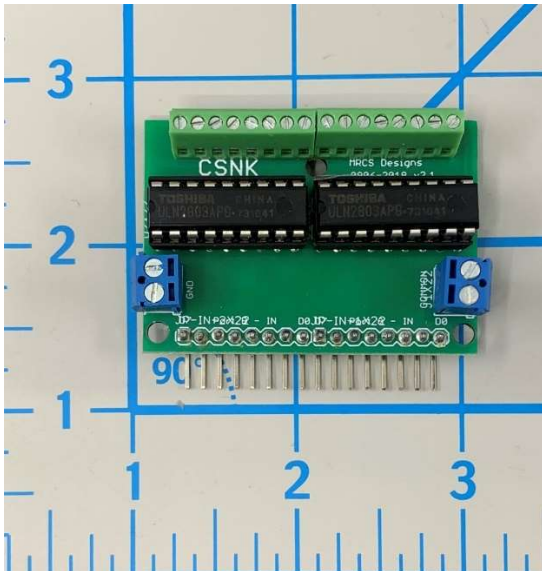
2.1. **BOARD IDENTIFICATION**

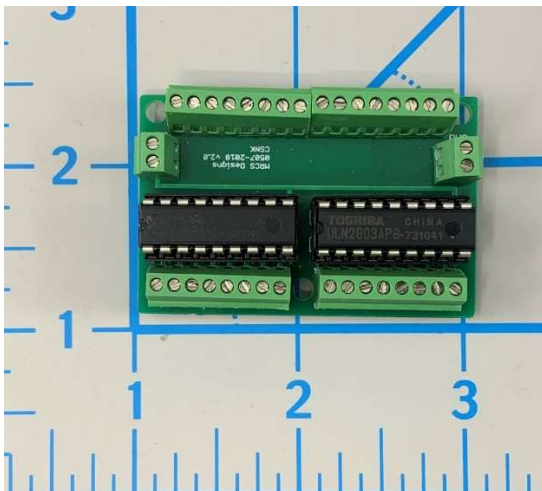Figure 1 - Rev 2.1 Board with Right Angle Input Connectors

Figure 2 - Rev 2.1 Board with screw terminals for input and output

Qty	Value	Device	Package	Parts	Description
0		CONNECTOR-M021X02-LOCK	1X02_LOCK	J1, J2	PHOENIX CONNECTOR
2		CONNECTOR-M023.5MM-LOCK	SCREWTERMINAL-3.5MM-2_LOCK	J1A, J2A	PHOENIX CONNECTOR
2		CONNECTOR-M08LOCK	1X08_LOCK	JP-OUT-1, JP-OUT-2	PHOENIX CONNECTOR
2		CONNECTOR-M08LOCK	1X08_LOCK	JP-IN-1, JP-IN-2	PHOENIX CONNECTOR
2	ULQ2803	ULN2803DIP	DIL18	U1, U2	Darlington Driver
1	PCB	PCB	PCB	Board	
2		18 pin dip socket	DIL18		18 pin dip socket
1		16 pin right angle header male	16 pin SIP	JP-IN-1, JP-IN2	16 pin right angle header male

Table 1- Bill of Materials Rev 2.1

Note use either the 16 pin right angle header OR the 2 8 position screw terminals, depending on option selected
Use either J1/J2 or J1A, J2A, depending on option
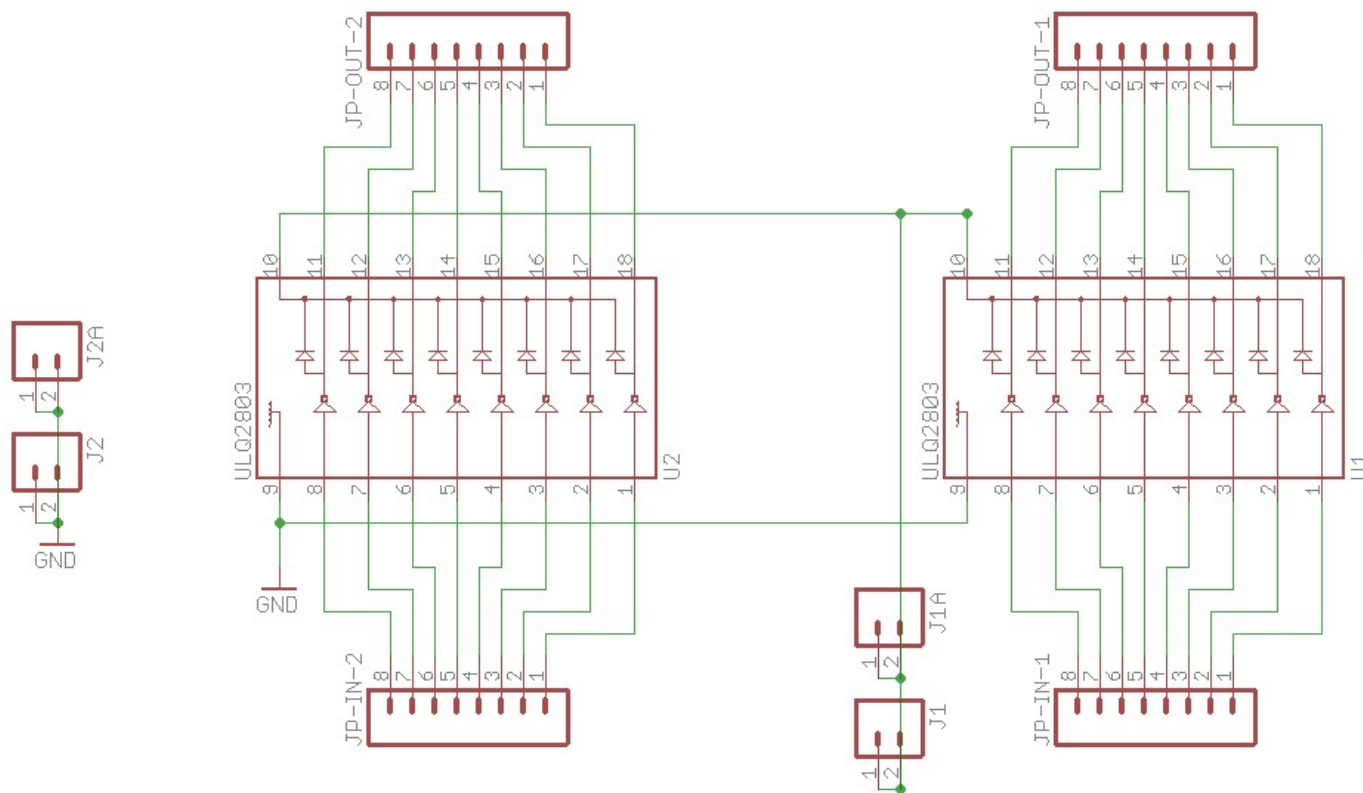
Figure 3 - Rev 2.1 Schematic

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3 OPTIONS

3.1. INPUT AND OUTPUT CONNECTORS

- The input and output connectors are on 0.100 centers (staggered slightly to hold the connectors in place during assembly). While our standard connector is the 0.100 screw terminal, you may substitute any other 0.100 connector you prefer. If you are ordering an assembled and tested unit from MRCS and you would prefer a different connector, please contact us at sales@modelrailroadcontrolsystems.com and indicate your preference and we'll provide a quotation.

- Ground and Load Supply (for clamping) are on J1, J1A, there are 0.100 (2.54 mm) and 3.5mm pads for these. You will need a ground for the Darlingtons in the ULN2803 to work. However the clamp voltage may not be needed:
    - If all the loads are resistive, like incandescent lamps, then you don't need to connect the clamp to supply voltage, so you could omit J1 or J1A (these are 0.100 and 3.5 mm pads respectively – just use 1).
    - If you are using the clamps (relays, solenoids, telegraph sounders etc.) all the loads on the CSNK must use the same supply.
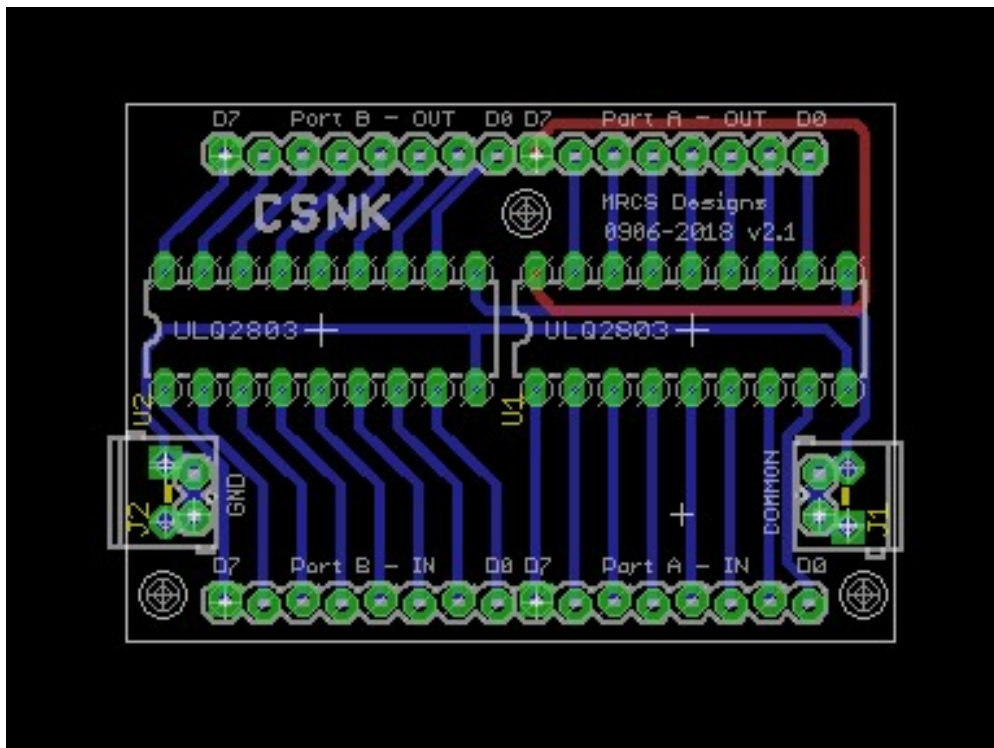
4 DETAILED ASSEMBLY

Figure 4 – CSNK V2.1 Parts Layout

All the components are through-hole technology with wire leads. A lead bender is a useful tool is for forming the leads at 90 degrees for easy insertion into the pad holes. The general rule is installing the lowest components first, working towards components that are higher off the board. Start by inserting the lower height components (resistors and diode). This enables you to support the low components as you solder them.

[ ] IC ULN2803
    [ ] install U1 socket, notch facing left. I recommend socketing for this application. The ULN2803 has no overcurrent protection, so wiring error or a load which fails short circuited may destroy the segment of the ULN2803. Socketing allows for easy replacement. If you choose to solder the ULN283 directly, do it now.

[ ] Input Connectors JP-IN-1, JP-IN-2
    [ ] Install JP-IN-1, JP-IN-2 if using crew terminals, if using right angle connectors, install from the bottom but it is easier to do them last.

[ ] Output Connectors
    Install JP-OUT-1, JP-OUT-2 using crew terminals

[ ] Ground Connectors J1 or J1A
    Select either 0.100 or 3.5mm connectors and install

[ ] Load Supply "clamp" Connectors J2 or J2A
    Select either 0.100 or 3.5mm connectors and install. Clamp refers to clamping inductive spikes from the load, not the physical style of connector. All loads on the board must use the same supply if using the clamp circuitry.

5 TESTING

Testing your CSNK is straightforward:

1. Mount the board securely
2. Connect an LED (observe polarity) in series with a suitable limiting resistor (RED Led, 330 Ohms at 5 Volts, 1,000 ohms at 12V) between the output terminal and test supply (could be a 9V battery with ground to ground on J1 and +9 to the LED/Limiting resistor)
3. Apply more than a volt (could be the + end of an AA or AAA cell through a 1K ohm resistor) to the input. (be sure to connect the - end of the battery to the ground on J1/J1A). The LED should light.
4. Repeat steps 2 and 3 for each input/output pair.

6   INSTALLATION AND CONNECTIONS

The CSNK is intended for use with MRCS' cpNode and IOX16/32 (release 2 or greater). It can be used to interface any logic level signal to high voltage/high current (up to 0.5A at up to 48V) loads. Be sure to provide an adequate ground. The CSNK ground must be connected to the logic ground of the cpNode/IOX chain driving it.

The Right-Angle input option allows for easy connection to the cpNode and IOX16/32.
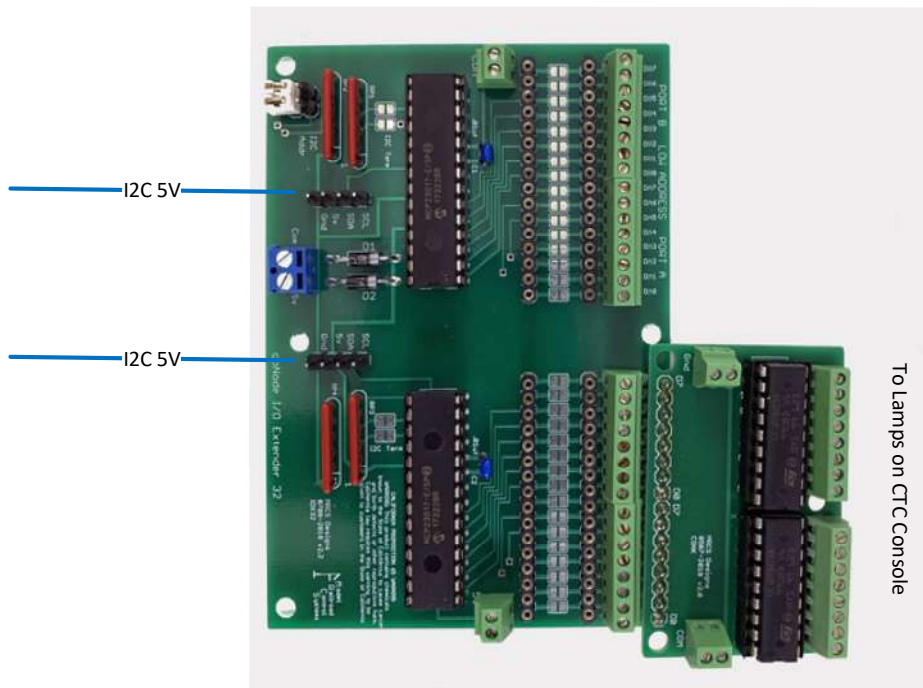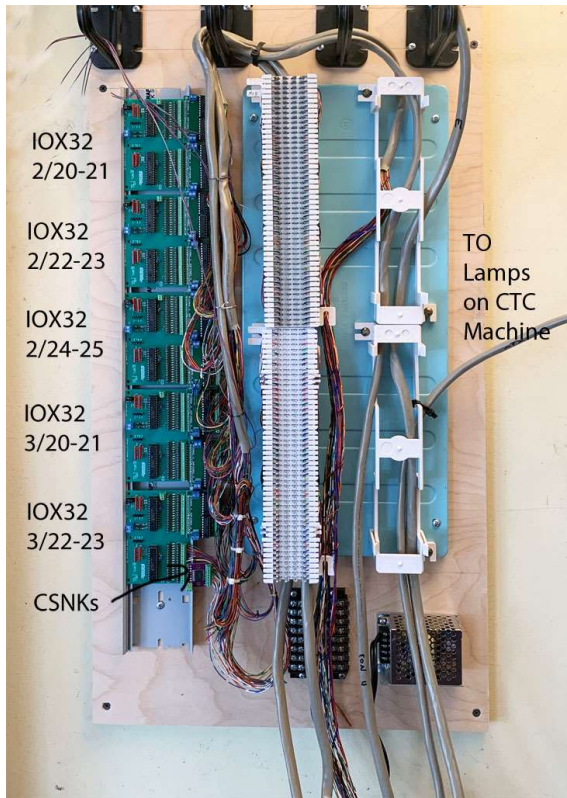

Figure 5 - IOX32 with CSNK

Figure 6 - IOX32s and CSNKS for CTC Demonstration at CSRM