Core64 LED ARRAY KIT V1.3
Manufacturing Instructions

Doc. Ver.	Description	Date	Author
A	First draft.	2023-05-22	Andrew Geppert
B	Update details and add complete sub-kitting details.	2025-01-01	Andrew Geppert

TABLE OF CONTENTS

TABLE OF CONTENTS

INTRODUCTION

This document explains the information required to:

- Manufacture the PCB
- Assemble the SMD components
- Test the PCB Assembly
- Create the sub-kit by adding the user assembled items into a labeled bag

MANUFACTURING FILES

Available in the sub-folders here:
https://github.com/ageppert/Core-64-Interactive-Core-Memory-Badge/tree/master/Electronic%20Design/Core64%20LA%20v1.3%20KiCAD%206/C64_LA_V1.3%20Manufacturing%20by%20ELECROW

This Instruction document: Core64 LED Array Manufacturing Instructions (B).pdf

PCB Gerber and drill files: Core64_LA_v1.3_Gerbers (removed JLC text).zip

PCBA BOM file: Core64 LA v1.3_BOM_SMD_Assembly.xlsx

Placement CPL file: Core64 LA v1.3_CPL_SMD_Assembly.xlsx

PCBA Sticker file: Core64 LA v1.3_PCBA_Sticker.docx

Sub-Kit BOM file: Core64 LA v1.3_BOM_sub-kit_Assembly.xlsx

Sub-Kit Label file: Core64 LED Array V1.3 Sub-Kit Label.docx

Diffuser Grid file: Core64 LA Diffuser Grid V11 Square 6.75mm centers.zip

PCB FABRICATION

Standard materials:

Material: FR4
Board Thickness: 1/16” inch
Copper Weight: 1 oz.
Solder Mask: White
Silkscreen: Black
Finish: HASL
Leadfree: Not required
Rails and panelization: manufacture’s choice, but please do not add tooling holes to the main PCB.
Remove manufacturing ID number.

PCBA SMD AUTOMATICALLY ASSEMBLED COMPONENTS

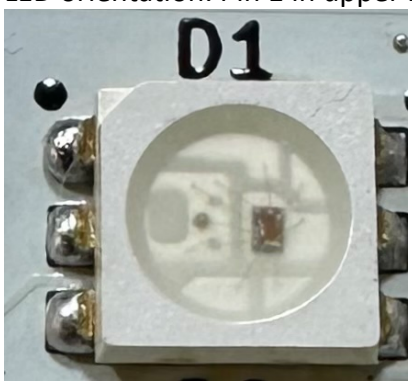
Serially Addressable RGB LED World Semi P/N WS2813C

1. The most challenging part of this assembly process is ensuring high quality LEDs are used to avoid rework after assembly and testing is completed. See Appendix A and B to identify GOOD and BAD LED types which have been observed. As of this writing, the quality seems to vary from different suppliers.

2. Observe moisture and component manufacturer baking recommendations for the LEDs in this assembly.

3. As of this writing, the only component allowed is WS2813C. A possible substitution may be WS2913B (much brighter with increased current draw) but must be approved by the author of this document.

4. LED orientation. Pin 1 in upper left with DOT on silkscreen and NOTCH on LED.



Capacitors

Substitutions are allowed. Please inform the author of this document prior to procurement to confirm the substitution details are acceptable.

Cleaning

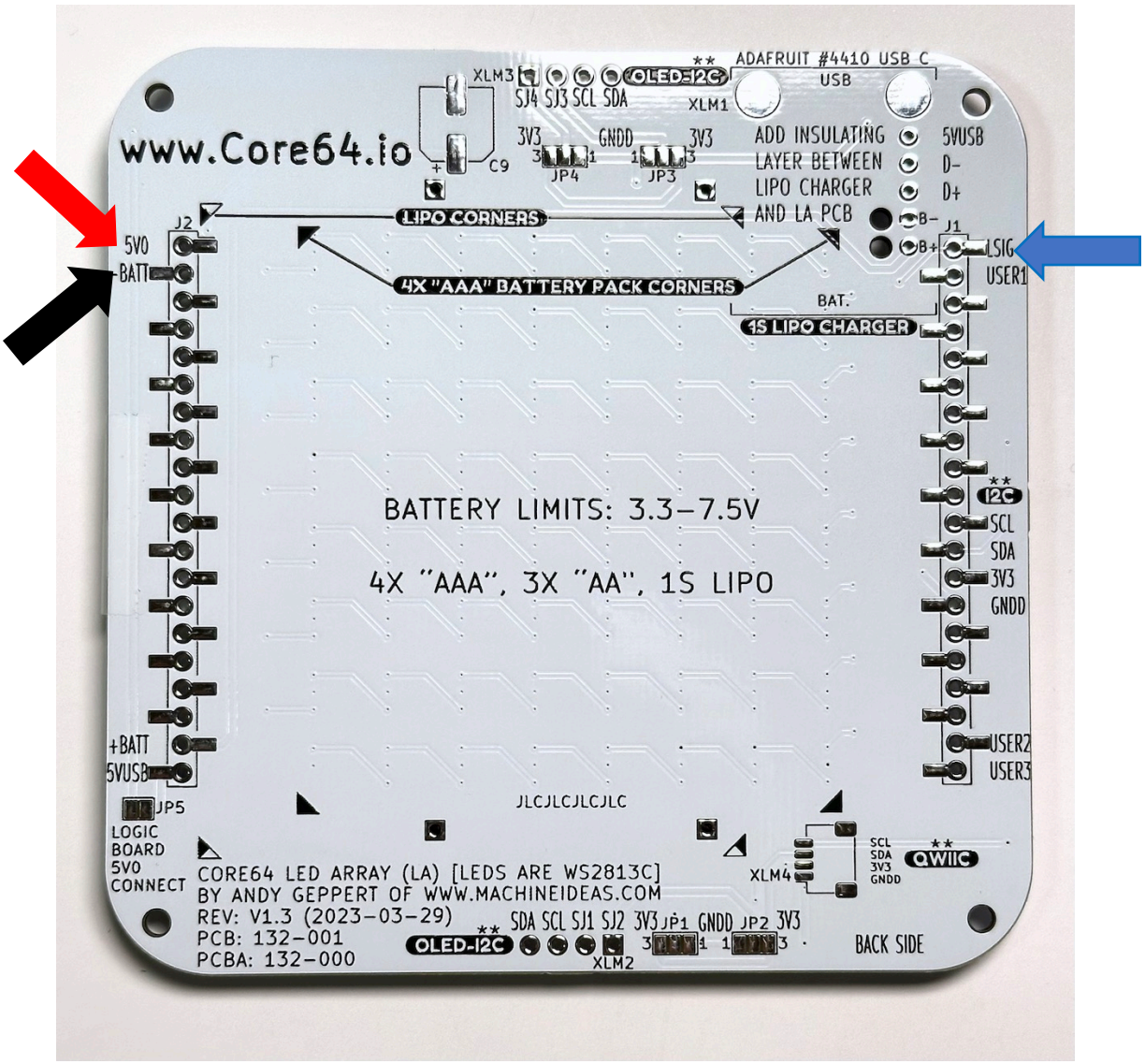
If flux is not visible to the unaided eye around the solder joints, cleaning is not required. If there is flux visible, cleaning is necessary.

PCBA TEST

Ensure all LEDs are functional with similar brightness. Each color (Red, Green, Blue) shall be tested in each LED.

Connections to the board for testing:

Label	Description
-BATT	Ground
5V0	3.3 or 5 VDC (must match the logic signal)
LSIG	LED Serial Data Signal (3.3 or 5 logic signal)



Testing may be accomplished with any Arduino compatible MCU board, or similar. The serially addressable LEDs require a library such as: https://github.com/adafruit/Adafruit_NeoPixel

All of the Core64 / Core64c / Core16 kits use a Raspberry Pi Pico W so that is a good choice for the test fixtures. This helps standardize all of the test firmware onto a common MCU platform.

A sample program is “Core64_LED_ARRAY_Test_RP2040_V1.ino.uf2”
Located: https://github.com/ageppert/Core-64-Interactive-Core-Memory-Badge/tree/master/Firmware%20Source%20Code/Core64_LED_ARRAY_Test

The file can be installed directly on the Pico by drag-n-drop with a USB cable connection. No IDE is needed. Boot the Pico with the boot button held down, and the Pico will show up on the desktop as a USB drive. Drag and drop the file “Core64_LED_ARRAY_Test_RP2040_V1.ino.uf2” onto the USB drive.

IMPORTANT: Make the power and signal wire connections to the LED Array PCBA without power ON. After the connections are made, power on the test fixture. After the test is completed, power OFF. Then remove the electrical connections from the PCBA.

When the Pico is powered on, the test program begins automatically. It cycles through these steps repeatedly with a 50% brightness level.

1) All LEDS RED
2) All LEDS GREEN
3) All LEDS BLUE

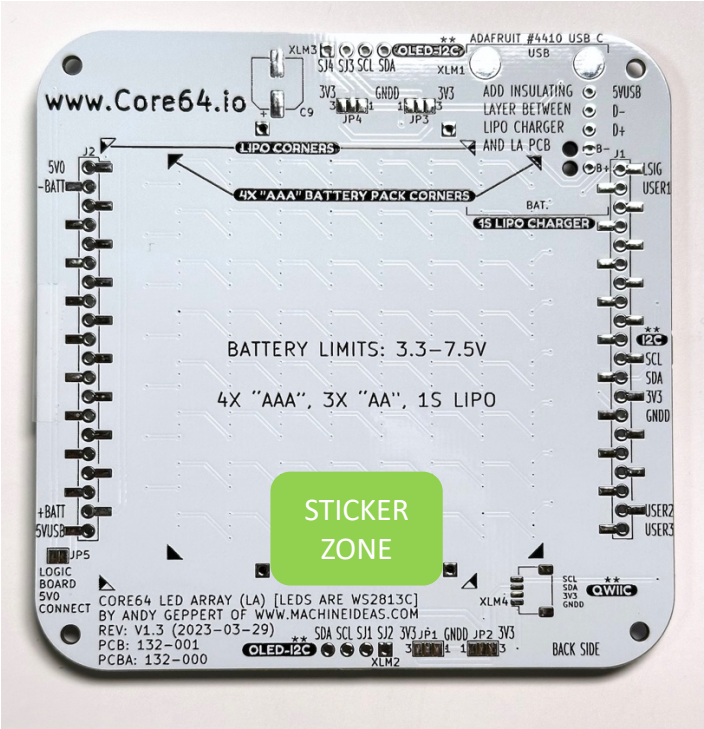
If each LED shows every color, then the test is passed.

If the test does not pass, rework the PCBA to replace all failed LEDs. Then retest.

PCBA MARKING

After the test is successfully completed, a sticker or laser etching is applied to the bottom side of the LED ARRAY Board.

Size: 1-3mm tall lettering
Sticker Zone Location: near the bottom, above the “PCBA: 132-000” field



Suggested Contents from “Core64 LA v1.3_PCBA_Sticker.docx”

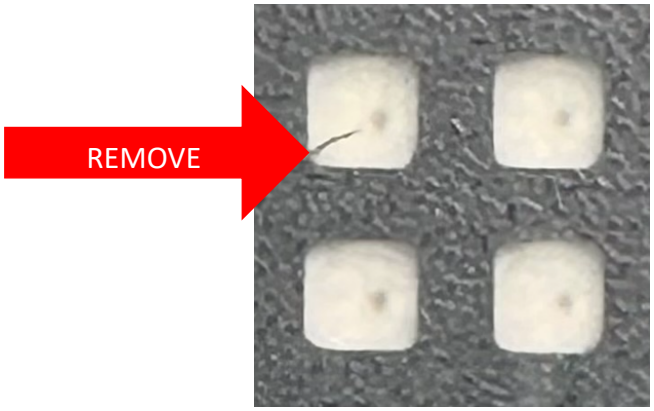
QC: Passed
MFR: Elecrow YYWW
PCBA VER: 1.3
LED: WS2813C

QC is Quality Check
Elecrow is manufacturer
YY is the last two digits of the year of assembly.
WW is the week number of assembly.
V1.3 denotes the version of the PCB Assembly. It will be updated if alternate components are used.
LED WS2813C is the LED used. If an alternate LED is used, the associated P/N will be substituted on the sticker.

PCBA KIT COMPONENTS

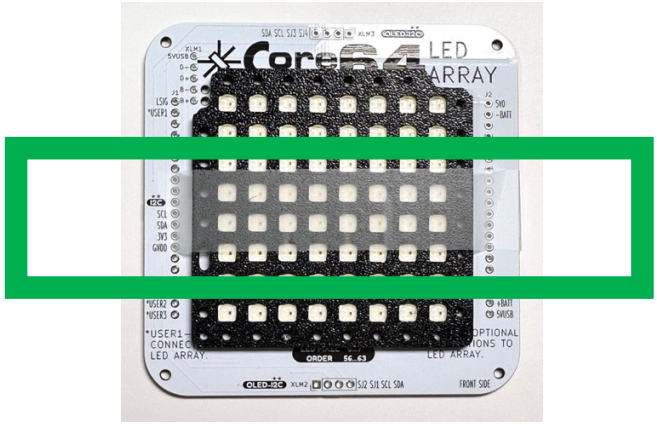
See “Core64 LA v1.3_BOM_sub-kit_Assembly.xlsx” for details of all components.
Bag color shown below may be different than bag used for production.

Inspect the LED DIFFUSER GRID for fuzzy bits or plastic bits left in the square openings. Here is an example of the plastic bit that needs to be cleaned out:

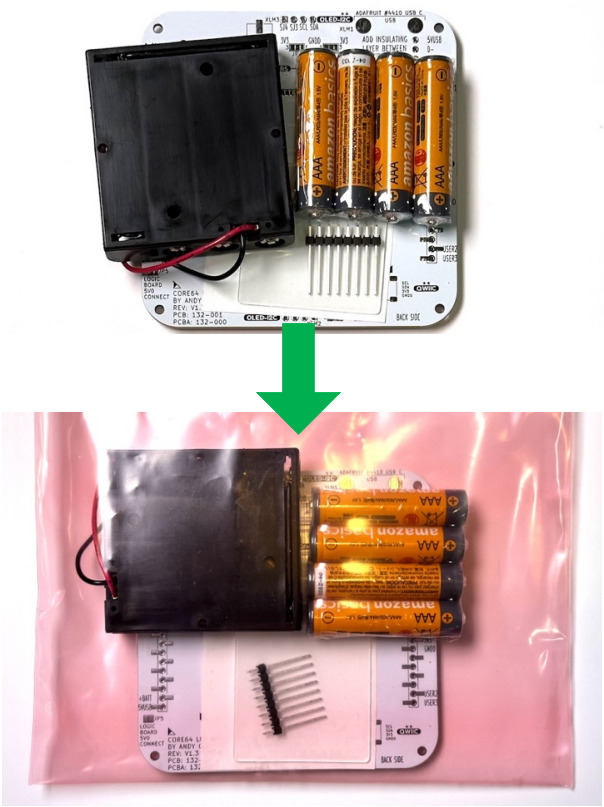


PCBA KIT ASSEMBLY

1. Gather the components.
2. Place sub-kit label on the bag.
3. Place LED diffuser over the LEDs and secure it in place with tape. This protects the LEDs during shipping. Place the tape in the green boxed zone:



4. Insert all components into the bag.



5. Ensure the loose components are placed behind the LED board, on the side with the LEDs.

APPENDIX A: EXAMPLES OF GOOD LEDS

This LED package resulted in LED Arrays with 100% yield.

Initially purchased as LCSC P/N _____ in 2022.

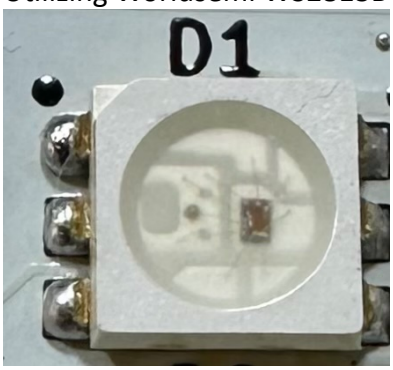
This LED sampled May 2023 and test assembled by the author, 64 of 64 worked first time.

DIGIKEY P/N 1597-1594

https://www.digikey.com/en/products/detail/seeed-technology-co-ltd/601000200/8120706

Supplied from SEEED Technology Co., Ltd

Utilizing Worldsemi WS2813B (5050) Ver. No. 5



APPENDIX B: EXAMPLES OF BAD LEDS

This version of the WS2813C provided low yields.

APPENDIX C: LED REFERENCE NOTES

Firmware Libraries for LED Control (WS2812 and WS2813 libraries are compatible):

https://github.com/adafruit/Adafruit_NeoPixel
https://learn.adafruit.com/adafruit-neopixel-uberguide

QUALITY CONCERNS

A test method for LED epoxy potting quality:
https://youtu.be/SWh7Watb_LE
from
https://wp.josh.com/2016/10/29/a-quick-test-for-crappy-ws2812b-neopixels/

Alternative to WS2812 is SK6812
https://cpldcpu.wordpress.com/2016/03/09/the-sk6812-another-intelligent-rgb-led/

More stories:
https://talk.vanhack.ca/t/psa-ws2812b-leds-may-not-be-what-you-think-they-are/5626