CORE 64 INTERACTIVE CORE MEMORY BADGE V0.5 LOGIC BOARD

Sheet: Power — File: Core64 LB v0.5 Power.sch

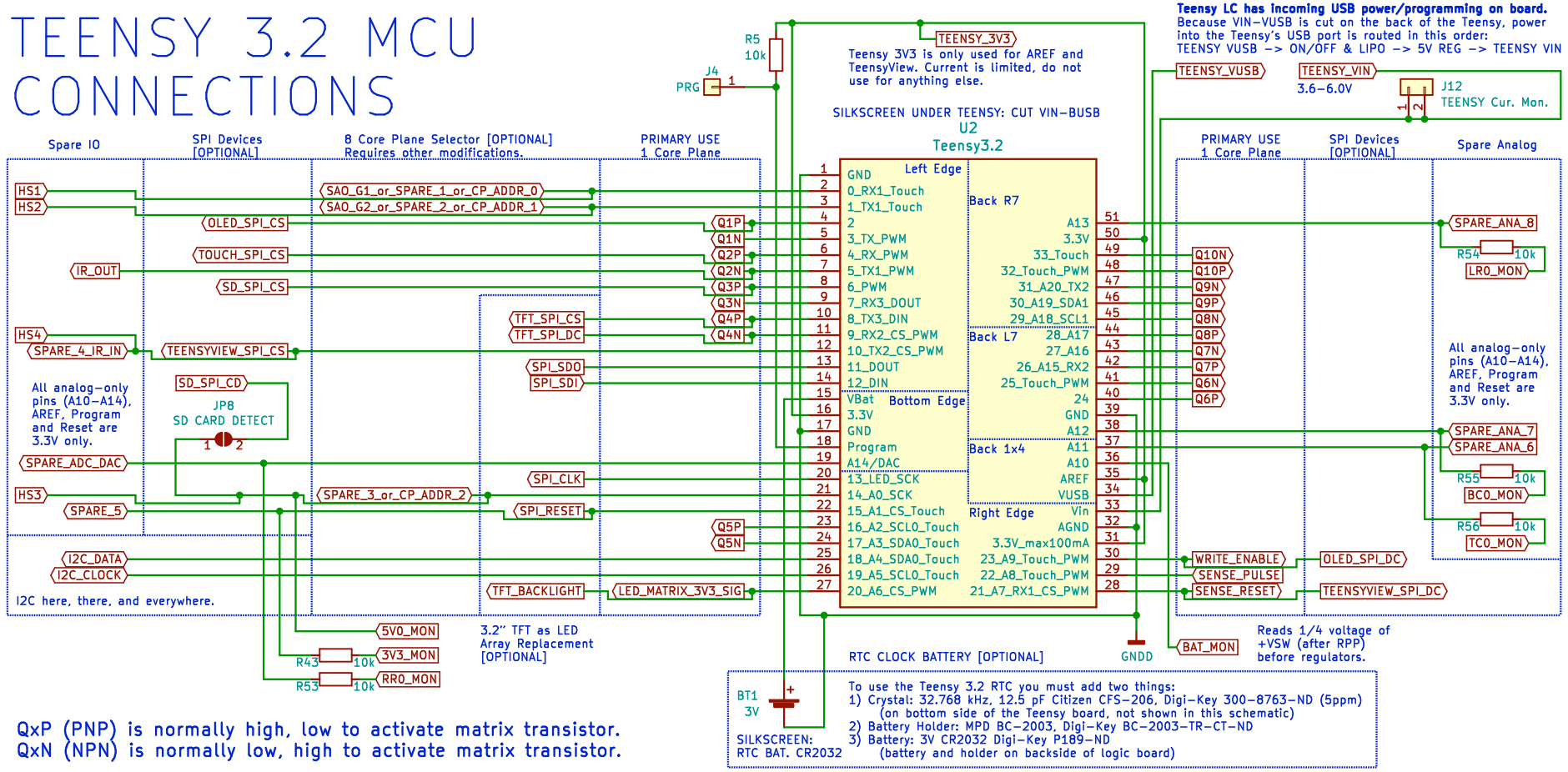
Sheet: Driver — File: Core64 LB v0.5 Driver.sch

Sheet: Sense_LEDs_ID — File: Core64 LB v0.5 Sense_LEDs_ID.sch

Sheet: Expansion — File: Core64 LB v0.5 Expansion.sch

*** MUST CUT THE USB–VIN on back of TEENSY 3.2 ***

TEENSY 3.2 MCU CONNECTIONS



QxP (PNP) is normally high, low to activate matrix transistor.
QxN (NPN) is normally low, high to activate matrix transistor.

SILKSCREEN FRONT

Interactive Core Memory
All logic is 3V3 Level

L1 Core_64_Logo

L2
Core_64_Logo

SILKSCREEN BACK

Core 64 Logo
Interactive Core Memory
QR Code
Maker
Website
RTC Battery CR2032
PCB Maker
Assembler
Serial Number
P/N
REV

All non–polarized capacitors are X7R or X5R ceramic unless otherwise noted.

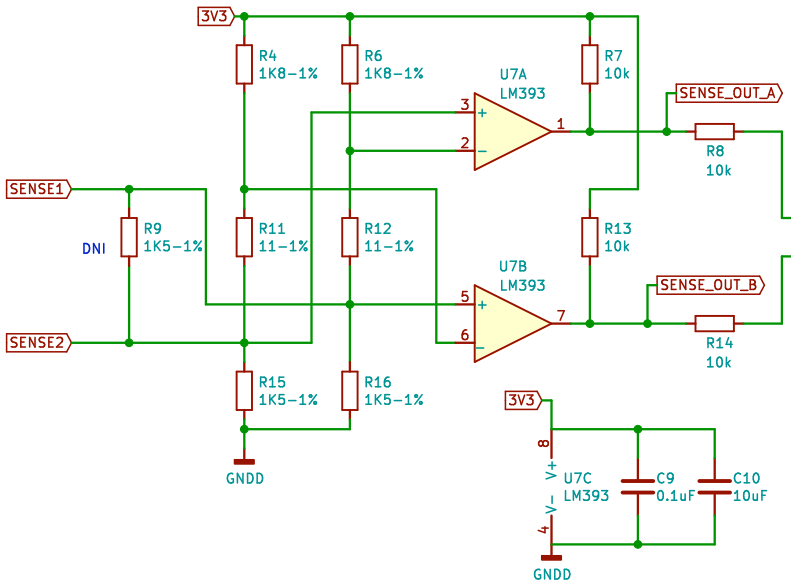
*** As prototyped. ***
Visit www.Core64.io for information on assembly and optional features.
Concept and design by Andy Geppert @ www.MachineIdeas.com

Sheet: /
File: Core64 LB v0.5.sch

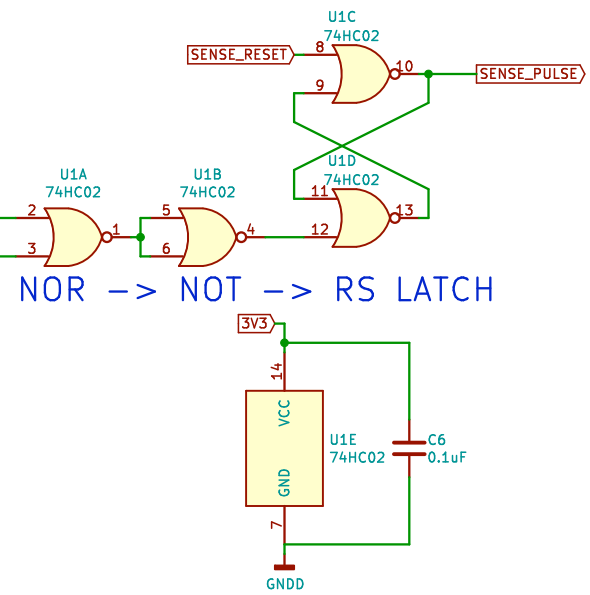
Title: Core 64 – Main Sheet Index

Size: A	Date: 2021–02–27	**Rev: 0.5**
KiCad E.D.A. kicad (5.1.2–1)–1		Id: 1/5

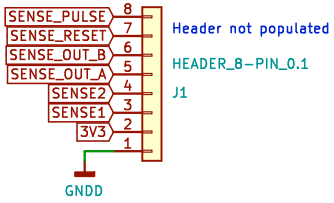
SENSE SIGNAL DIFFERENTIAL AMPLIFIERS



SENSE SIGNAL LATCH

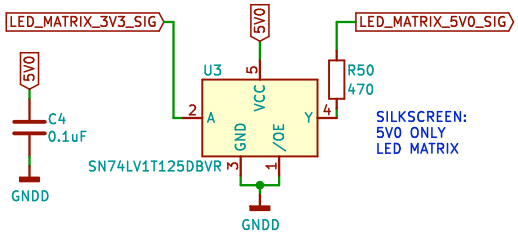


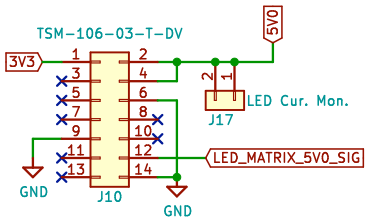
SENSE DEBUG



SILKSCREEN: 3V3 ONLY
SENSE DEBUG

LED MATRIX DRIVE AND LEVEL SHIFT



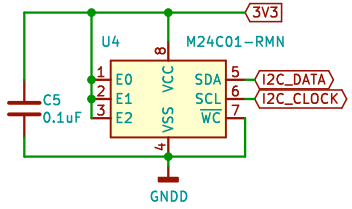


TSM-106 (2x6) required
TSM-107 (2x7) alternate

Symbol view is looking down on the front face of the Logic Board, with the male header pins pointing up at you.

BOARD ID AND S/N

EEPROM I2C ADDRESS: 0b1010111, 0x57 (87)



All non-polarized capacitors are X7R or X5R ceramic unless otherwise noted.

*** As prototyped. ***
Visit www.Core64.io for information on assembly and optional features.
Concept and design by Andy Geppert © www.MachineIdeas.com

Sheet: /Sense_LEDs_ID/
File: Core64 LB v0.5 Sense_LEDs_ID.sch

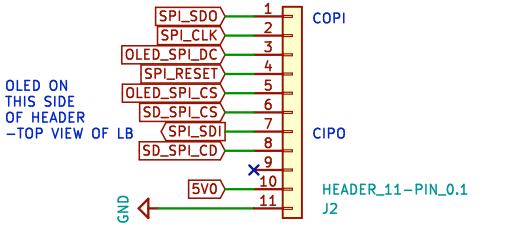
Title: Core 64 – Sense

Size: A	Date: 2021-02-27	**Rev: 0.5**
KiCad E.D.A. kicad (5.1.2-1)-1		Id: 2/5

EVERYTHING ON THIS SHEET IS USER-PROVIDED OPTIONAL ADD-ONS

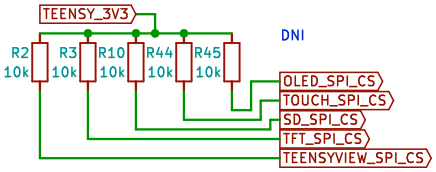
OLED COLOR SPI w/MicroSD

Compatible: https://www.adafruit.com/product/1431
1.5" 128x128, 16-bit color w/MicroSD holder
OLED has 5V -> 3V3 regulator onboard.
MicroSD card standalone pins shared between TFT and OLED boards.

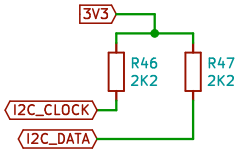


SILKSCREEN: 3V3 Logic ONLY, 3V3/GND sides of jumpers, SPI OLED

SPI CS PULL-UPS

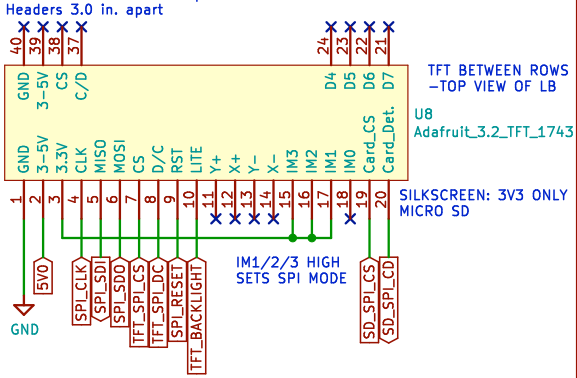


I2C PULL-UPS



3.2" TFT LCD SPI w/MicroSD

Compatible with https://www.adafruit.com/product/1743
TFT has 5V -> 3V3 regulator onboard.
MicroSD card standalone pins shared between TFT and OLED boards.
Headers 3.0 in. apart

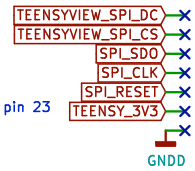


TFT LCD SOCKETS FOR LOGIC BOARD:
1x SAMTEC 20-pin SMD Header SSW-120-22-F-S-VS
2x SAMTEC 4-pin SMD Header SSW-104-22-F-S-VS

OLED TEENSYVIEW SPI

Monochrome 128x32
The TeensyView is designed to stack on the Teensy 3.2
Configuration: https://www.sparkfun.com/products/14048

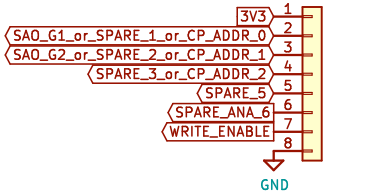
Use only these Teensy pins:
21: D/C (default is 5)
10: CS
11: MOSI
13: SCLK
15: RESET
3.3V Power from Teensy next to pin 23
GND at corner next to pin 0



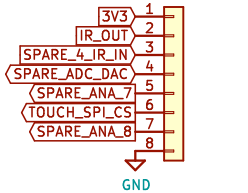
OLED SOCKET FOR LOGIC BOARD:
SAMTEC 4-pin SMD Header SSW-104-22-F-S-VS

GPIO#1

Silkscreen: 3V3 ONLY
pin names

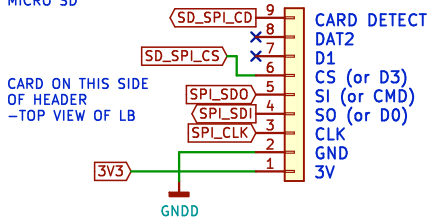


GPIO#2



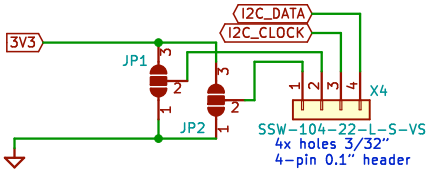
MICRO SD CARD

Compatible with https://www.adafruit.com/product/4682
MicroSD card standalone pins shared between TFT and OLED boards.



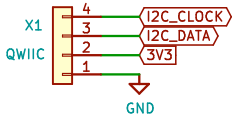
OLED MONOCHROME I2C

Generic 0.96" (128x64) or 1.5" (128x128)
I2C 4-pins, often ADDRESS: 0x3C (60 decimal)
Alternate is 0x3D, not 0x7A or 0x78 (wrong 8-bit)!
Must choose power polarity by soldering SJS.



SILKSCREEN: 3V3 ONLY, 3V3/GND sides of jumpers,
I2C OLED and pin names

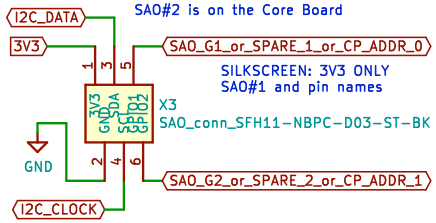
QWIIC I2C



SILKSCREEN: 3V3 ONLY
QWIIC I2C and pin names

SAO #1 SIMPLE ADD ONS

SAO#2 is on the Core Board



https://hackaday.io/project/175182-simple-add-ons-sao
using Sullins SFH11-NBPC-D03-ST-BK female header
https://www.digikey.com/product-detail/en/sullins-connector-solutions/SFH11-NBPC-D03-ST-BK/S9717-ND/4558818

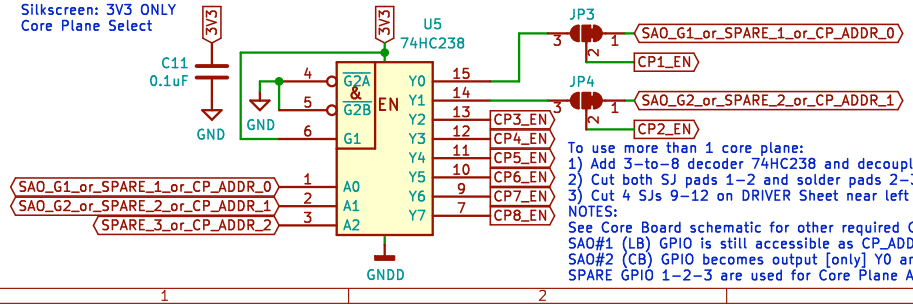
I2C ADDRESS TABLE

INCLUDED:	
AMBIENT LIGHT SENSOR	0X29 (47)
HALL SENSOR 1	0x30 (48)
HALL SENSOR 2	0x31 (49)
HALL SENSOR 3	0x32 (50)
HALL SENSOR 4	0x33 (51)
EEPROM (BOARD ID)	0x57 (87)
OPTIONAL:	
OLED	0x3C (60)
AND!XOR IO Exp. MCP23017	0x20 (32)
AND!XOR EEPROM AT24C32r	0x50 (80)
NFC CLICK PN7120	0x50-53
PIMORONI UNICORN HAT	0x50 (N.C.)

All 7-bit addresses should be greater
than 0x07 and less than 0x78 (120).

CORE PLANE & CORE BOARD SAO #2 GPIO SELECT

Silkscreen: 3V3 ONLY
Core Plane Select



To use more than 1 core plane:
1) Add 3-to-8 decoder 74HC238 and decoupling capacitor.
2) Cut both SJ pads 1-2 and solder pads 2-3.
3) Cut 4 SJs 9-12 on DRIVER Sheet near left 20p socket for CP5-8.
NOTES:
See Core Board schematic for other required CB changes.
SAO#1 (LB) GPIO is still accessible as CP_ADDR_0 and 1, shared.
SAO#2 (CB) GPIO becomes output [only] Y0 and Y1 of CP selector.
SPARE GPIO 1-2-3 are used for Core Plane Addressing.

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*** As prototyped. ***
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Concept and design by Andy Geppert @ www.MachineIdeas.com

Sheet: /Expansion/
File: Core64 LB v0.5 Expansion.sch

Title: Core 64 - Expansion

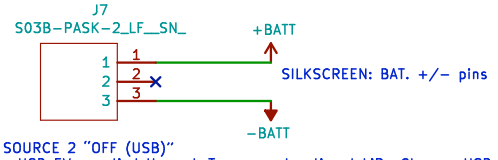
Size: A	Date: 2021-02-27	**Rev: 0.5**
KiCad E.D.A. kicad (5.1.2-1)-1		Id: 3/5

STANDARD KIT CONFIGURATION – AS MANUFACTURED

TWO POWER INPUT SOURCES SELECTED BY SPDT SWITCH

SOURCE 1 "ON (BAT)"
BUILT-IN BATTERY PACK (Keystone 2482 or 2482CN) WITH 4X "AAA" primary/Alkaline Cells
OK to use Energizer Ultimate Lithium (light weight!) with open cell 7.2V, loaded will be <7V.
Battery Pack includes wires and may or may not have a 3-pin plug.

Optional Socket: TH, Side Entry, JST PA S03B-PASK-2(LF)(SN), Digikey 455-1848-ND



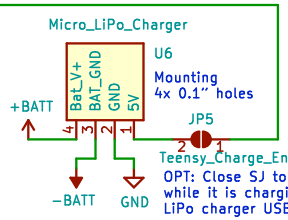
SILKSCREEN:
7.5V MAX !!!
Limitation of 5V0 regulator.

SOURCE 2 "OFF (USB)"
USB 5V supplied through Teensy and optional LiPo Charger USB port.
With the VIN-VUSB trace cut on the back of the Teensy, the TEENSY_VUSB is taken off of the Teensy Board and routed on the Core64 LB to the lower position of the power switch. From here, it powers the whole Core64 system and routes back to the TEENSY_VIN after passing through the 5V LDO regulator.

ALTERNATE 1S LIPO BATTERY – USER SUPPLIED

1) Remove the 4x "AAA" battery pack AND the battery connector.
2) Purchase and install a LiPo charge manager.
   a) The board is designed to accept this one: https://www.adafruit.com/product/1904 (Micro USB) and 4410 (USB C).
   b) Solder the the charge manager directly to the board to keep a low profile.
3) Purchase and install a 1S LiPo using double-sided tape.
   a) Choose a 1S Lipo with built-in cell over/under voltage protection. Recommended:
      2500mAh https://www.adafruit.com/product/328 1.8" x 2.4" x 0.26" (47mm x 61mm x 6.7mm)
      2000mAh https://www.adafruit.com/product/2011 2.4" x 1.4" x 0.3" (60mm x 36mm x 7mm)
      1200mAh https://www.adafruit.com/product/258 1.3" x 2.4" x 0.2" (34mm x 62mm x 5mm)
   b) The LiPo can be up to 50 x 65 x 15mm. A maximum
   a) Make sure no part of the LiPo foil pouch can short-out adjacent pins or pads in the area. Insulate with Kapton tape.

Configuration of the Teensy_Charge_Enable Solder Jumper (SJ):
A) DEFAULT SJ OPEN:
   If you do NOT want the system to be powered from teh USB port of the charger, leave the SJ open.
   Connecting a USB cable to the LiPo charger will ONLY charge the battery and power the system when the power switch is in ON (up/battery) position.
   Connecting a USB cable to the Teensy will NOT charge the battery, but it will power the system when the power switch is in OFF (down/USB) position.
B) OPTIONAL SH CLOSED:
   The LiPo charger 5V pin (LiPo Charger USB port) may be connected to the Teensy USB port by closing the SJ.
   Connecting a USB cable to the LiPo charger will charge the battery and power the system. It will not connect to the serial port of the Teensy.
   Connecting a USB cable to the Teensy will power the board and charge the batter and connect to the serial port of the Teensy.



1S LIPO ONLY !!!
Do NOT connect AAAs to a LiPo charger!
You will destroy the charging chip.

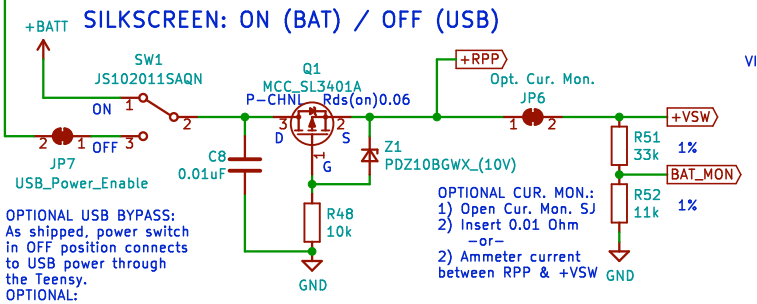
SILKSCREEN: BAT. + BAT. –
SILKSCREEN: +/– pins
SILKSCREEN: LIPO CHARGER

***** ALL CONFIGURATIONS REQUIRE CUTTING VIN-VUSB TRACE ON BACK OF TEENSY *****

TEENSY_VUSB

TEENSY_VIN

POWER SWITCH, RPP, V & I MONITOR



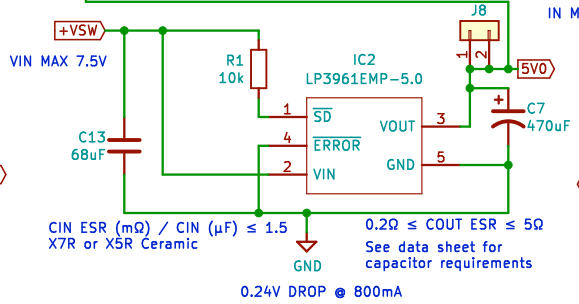
OPTIONAL USB BYPASS:
As shipped, power switch in OFF position connects to USB power through the Teensy.
OPTIONAL:
Cut SJ if you want the OFF position to not be powered from Teensy USB connector.

OPTIONAL FET PROTECT:
1) 10nF Cap. on left
2) 10V Zener on right

OPTIONAL CUR. MON.:
1) Open Cur. Mon. SJ
2) Insert 0.01 Ohm
–or–
2) Ammeter current between RPP & +VSW

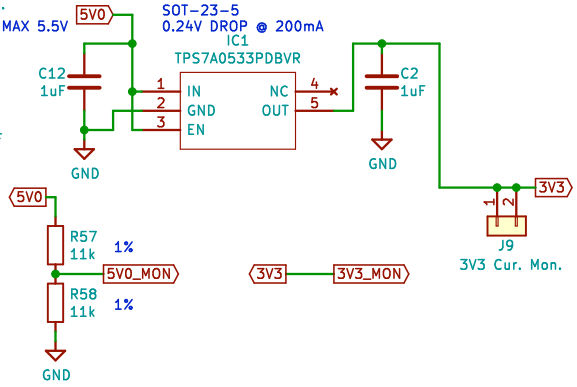
5V POWER SUPPLY

LED ARRAY, TEENSY VIN, OPTIONAL TFT & COLOR OLED



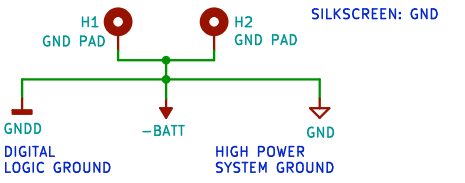
3.3V POWER SUPPLY

CORES, ACCESSORIES, ALL LOGIC

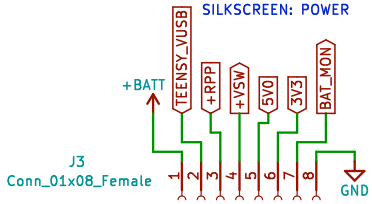


ALL SYSTEM GROUND

GND PAD 3.2 mm (.125 in) thru-hole for M3 or #4 screw



POWER RAILS



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Sheet: /Power/
File: Core64 LB v0.5 Power.sch

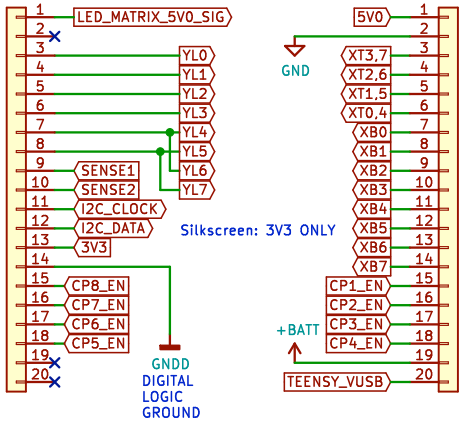
Title: Core 64 – Power Schematic

Size: A	Date: 2021-02-27	**Rev: 0.5**
KiCad E.D.A. kicad (5.1.2-1)-1		Id: 4/5

CORE BOARD INTERCONNECTS

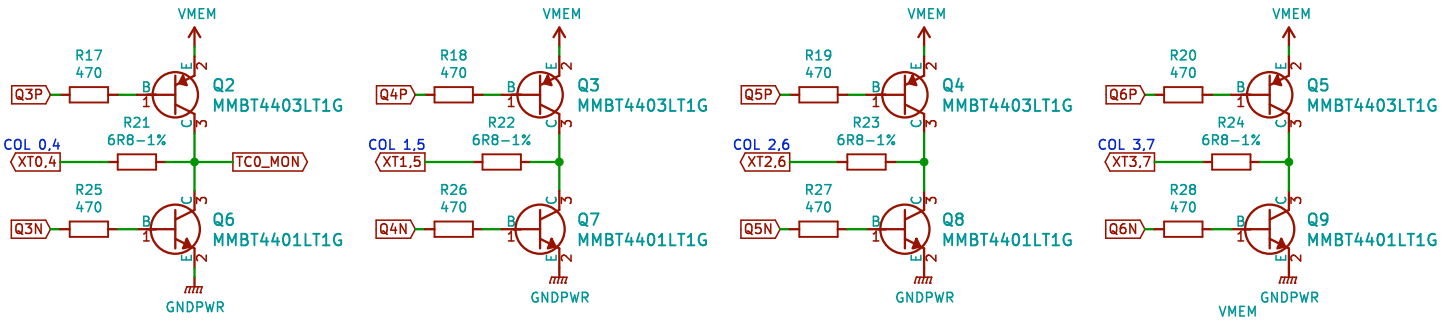
J11
SSW-116-22-F-S-VS

J14
SSW-116-22-F-S-VS

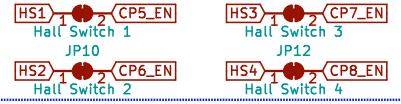


CORE MATRIX TOP COLUMN DRIVERS

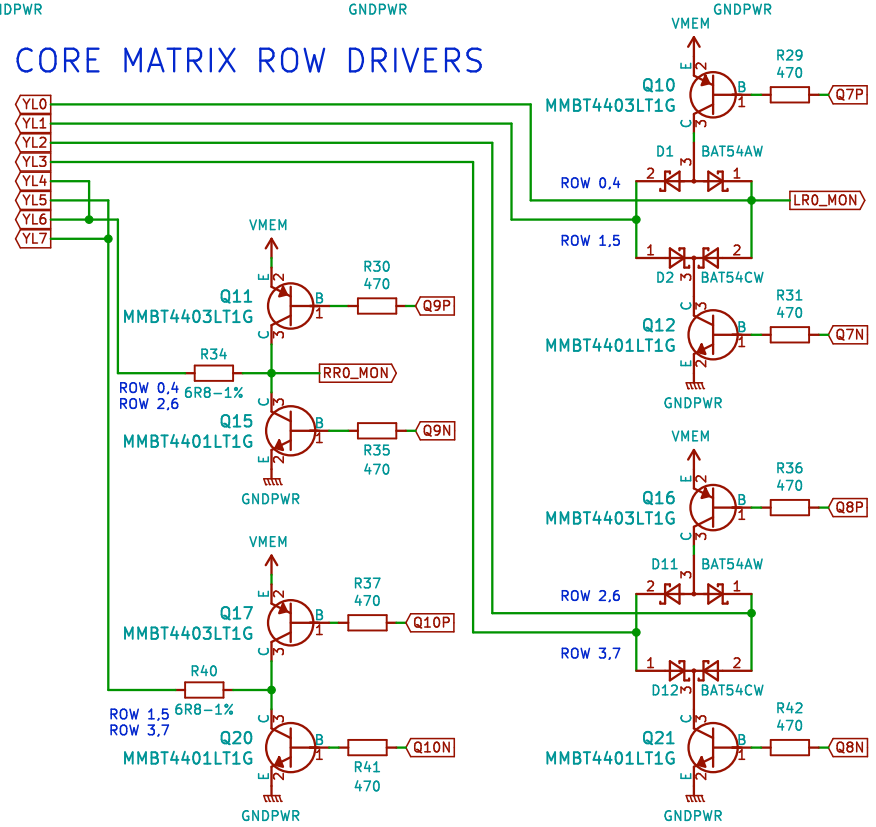
Drive Transistor current: 3.3/470=7mA



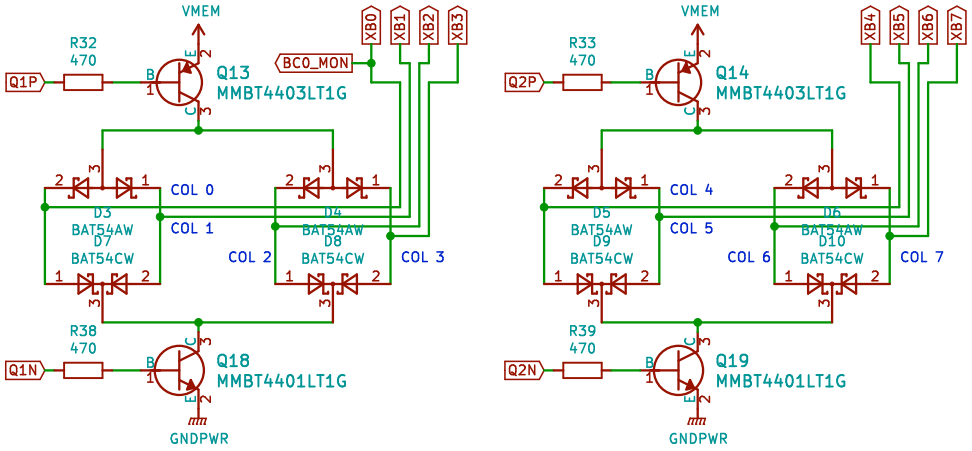
HALL SWITCHES (PLAN B...)



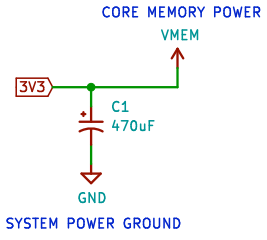
CORE MATRIX ROW DRIVERS



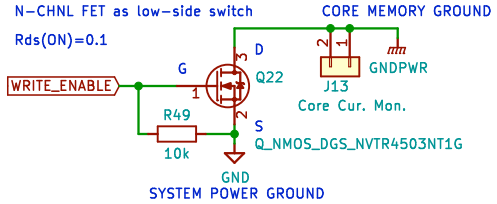
CORE MATRIX BOTTOM COLUMN DRIVERS



CORE MATRIX POWER



CORE MATRIX WRITE ENABLE



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QxN (NPN) is normally low, high to activate matrix transistor.

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Concept and design by Andy Geppert © www.MachineIdeas.com

Sheet: /Driver/
File: Core64 LB v0.5 Driver.sch

Title: Core 64 – Core Matrix Driver

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