LED MATRIX ARRAY #1
File: LED_MATRIX_ARRAY_1.kicad_sch

LED MATRIX ARRAY #2
File: LED_MATRIX_ARRAY_2.kicad_sch

COL[1..16]

ROW8
ROW7
ROW6
ROW5
ROW4
ROW3
ROW2
ROW1

ROW8
ROW7
ROW6
ROW5
ROW4
ROW3
ROW2
ROW1

COL[17..32]

COL[1..16]
ROW1 ROW2 ROW3 ROW4 ROW5 ROW6 ROW7 ROW8
COL[17..32]

POWER SHEET

I2S MIC

STM32 MCU

I2S_SD
I2S_SCK
I2S_WS

I2S_SD
I2S_SCK
I2S_WS

SPI_MOSI
SPI_CLK/SWD_SWO
SPI_CS
GPIO_LED

SPI_MOSI
SPI_CLK
SPI_OE
GPIO_LE

LED DRIVING

File: POWER_SHEET.kicad_sch
File: I2S_MIC.kicad_sch
File: STM32_MCU.kicad_sch
File: LED_DRIVING.kicad_sch

H1
MountingHole_Pad

H2
MountingHole_Pad
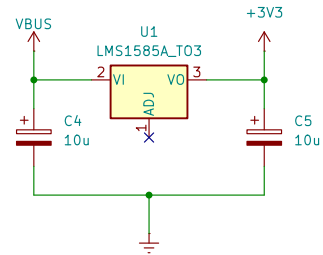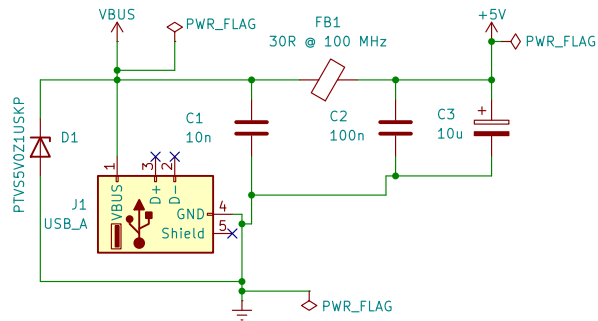
H3
MountingHole_Pad

H4
MountingHole_Pad

Sheet: /
File: i2s_spekky_matrix.kicad_sch
Title: Spekky Matrix Schematic
Size: A5        Date: 2024-11-25        Rev: v12
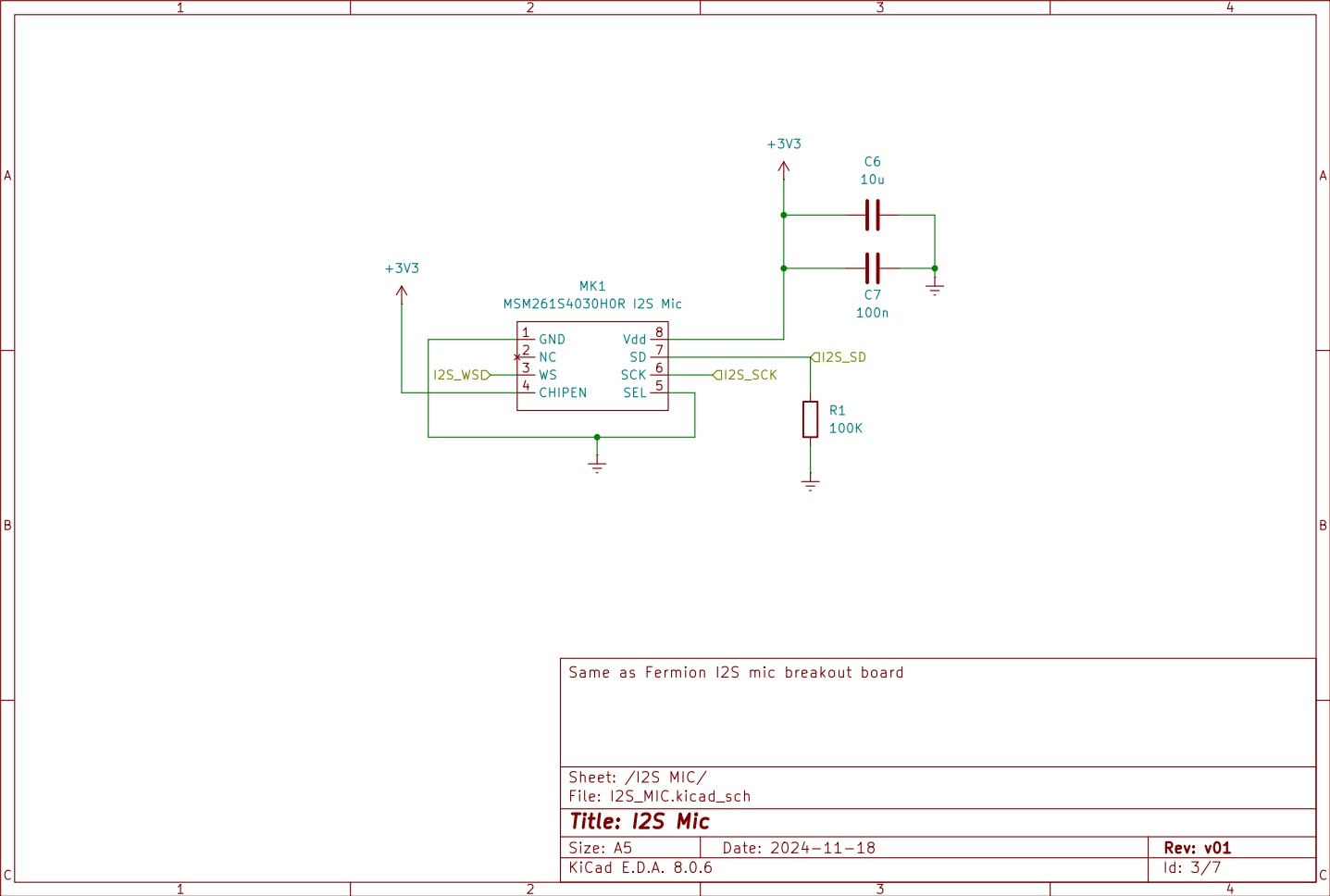KiCad E.D.A. 8.0.6        Id: 1/7

VBUS
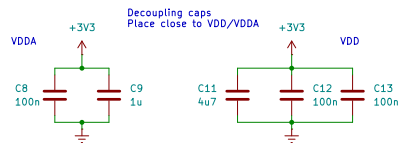
PWR_FLAG

FB1
30R @ 100 MHz

+5V

PWR_FLAG

PTVS5V0Z1USKP

D1

C1
10n

C2
100n

C3
10u

+

J1
USB_A

1 VBUS

3 D+
2 D-

4 GND
5 Shield

PWR_FLAG

VBUS

U1
LMS1585A_TO3

2 VI      VO 3

ADJ
1

+3V3

C4
10u

+

C5
10u

+

+3V3

C6
10u

C7
100n

MK1
MSM261S4030H0R I2S Mic

+3V3

| 1 | GND | Vdd | 8 |
| 2 | NC | SD | 7 |
| 3 | WS | SCK | 6 |
| 4 | CHIPEN | SEL | 5 |

I2S_WSD

I2S_SD

I2S_SCK

R1
100K

Same as Fermion I2S mic breakout board

**Reset circuit**

SW1
SW_Push

C10
100n

D2
PTVS5V0Z1USKP

+3V3

NRST

U2
STM32G431K8Ux

PG10  VDD  VDDA
VDD

NRST — 4  PG10

I2S_WS — 2  PF0
I2S_SCK — 3  PF1

SPI_CLK/SWD_SWO — 13  PB0
26  PB3
27  PB4

SPI_MOSI — 28  PB5
29  PB6
30  PB7
31  PB8

PA0 — 5
PA1 — 6
PA2 — 7
PA3 — 8
PA4 — 9 — GPIO_LE
PA5 — 10
PA6 — 11
PA7 — 12
PA8 — 18 — SPI_CS
PA9 — 19

GPIO_DEBUG1

PA10 — 20
PA11 — 21 — I2S_SD
PA12 — 22
PA13 — 23 — SWD_SWDIO
PA14 — 24 — SWD_SWCLK
PA15 — 25

VSS — 16
VSSA — 15

R2
10K

D3

R3
1K

**I2S Fsamp calculation: via STM32G431x reference manual**

Fsamp = FI2sclk/[(64)(2(I2SDIV + ODD))]

Currently FI2sclk is set to the HCLK * APB prescaler (HSI clock, 16 MHz)

(64 as DATALEN != 0b00, instead SD out is 24-bits therefore CHLEN = 1, otherwise replace 64 w/ 32)

+3V3

J2
Conn_ARM_JTAG_SWD_10

VTref — 1
RESET — 10 — NRST

SWCLK/TCK — 4 — SWD_SWCLK
SWDIO/TMS — 2 — SWD_SWDIO
SWO/TDO — 6 — SPI_CLK/SWD_SWO
NC/TDI — 8

GNDDetect — 9
GND — 3

**Decoupling caps**
**Place close to VDD/VDDA**

VDDA    +3V3

C8
100n

C9
1u

+3V3    VDD

C11
4u7

C12
100n

C13
100n

On Nucleo32-STM32G431KB devices PF0 and PF1 are disconnected.
SB11 and SB8 must be connected for this schematic to work.
Decoupling capacitor info can be found on datasheet and application note AN5093
No ADC therefore tying VDDA to VDD and GNDA to GND

Sheet: /STM32 MCU/
File: STM32_MCU.kicad_sch

**Title: STM32G431KB Schematic**

Size: A4 | Date: 2024-11-24 | Rev: v03
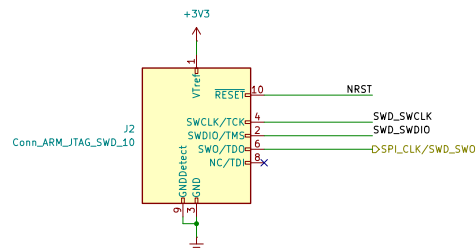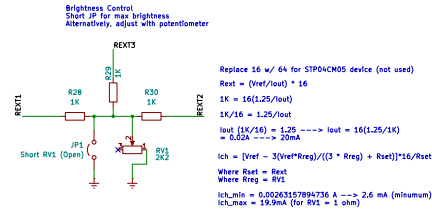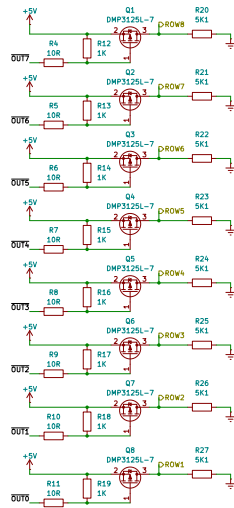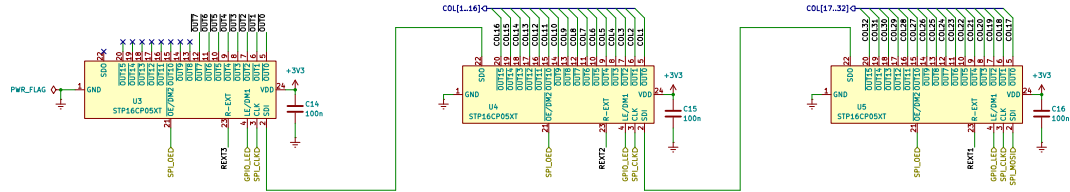KiCad E.D.A. 8.0.6 | | Id: 4/7

Cascade Direction
Last (in chain) <--- First (in chain)

COL[1..16]
COL[17..32]

PWR_FLAG

U3
STP16CP05XT

U4
STP16CP05XT

U5
STP16CP05XT

+3V3
C14 100n

+3V3
C15 100n

+3V3
C16 100n

REXT3
REXT2
REXT1

**Brightness Control**
Short JP for max brightness
Alternatively, adjust with potentiometer

REXT3

REXT1      R28      R29      R30      REXT2
           1K       1K       1K

JP1
Short RV1 (Open)

RV1
2K2

Replace 16 w/ 64 for STP04CMO5 device (not used)

Rext = (Vref/Iout) * 16

1K = 16(1.25/Iout)

1K/16 = 1.25/Iout

Iout (1K/16) = 1.25 ---> Iout = 16(1.25/1K)
= 0.02A ---> 20mA

Ich = [Vref - 3(Vref*Rreg)/((3 * Rreg) + Rset)]*16/Rset

Where Rset = Rext
Where Rreg = RV1

Ich_min = 0.00263157894736 A --> 2.6 mA (minumum)
Ich_max = 19.9mA (for RV1 = 1 ohm)

+5V      Q1      R20
         DMP3125L-7      5K1      ROW8
R4 10R   R12 1K
OUT7

+5V      Q2      R21
         DMP3125L-7      5K1      ROW7
R5 10R   R13 1K
OUT6

+5V      Q3      R22
         DMP3125L-7      5K1      ROW6
R6 10R   R14 1K
OUT5

+5V      Q4      R23
         DMP3125L-7      5K1      ROW5
R7 10R   R15 1K
OUT4

+5V      Q5      R24
         DMP3125L-7      5K1      ROW4
R8 10R   R16 1K
OUT3

+5V      Q6      R25
         DMP3125L-7      5K1      ROW3
R9 10R   R17 1K
OUT2

+5V      Q7      R26
         DMP3125L-7      5K1      ROW2
R10 10R  R18 1K
OUT1

+5V      Q8      R27
         DMP3125L-7      5K1      ROW1
R11 10R  R19 1K
OUT0

STP16CP05 based cascaded LED matrices

Sheet: /LED DRIVING/
File: LED_DRIVING.kicad_sch
Title: *8x32 LED Matrix*
Size: A3      Date: 2024-11-24      Rev: v03
KiCad E.D.A. 8.0.6      Id: 5/7
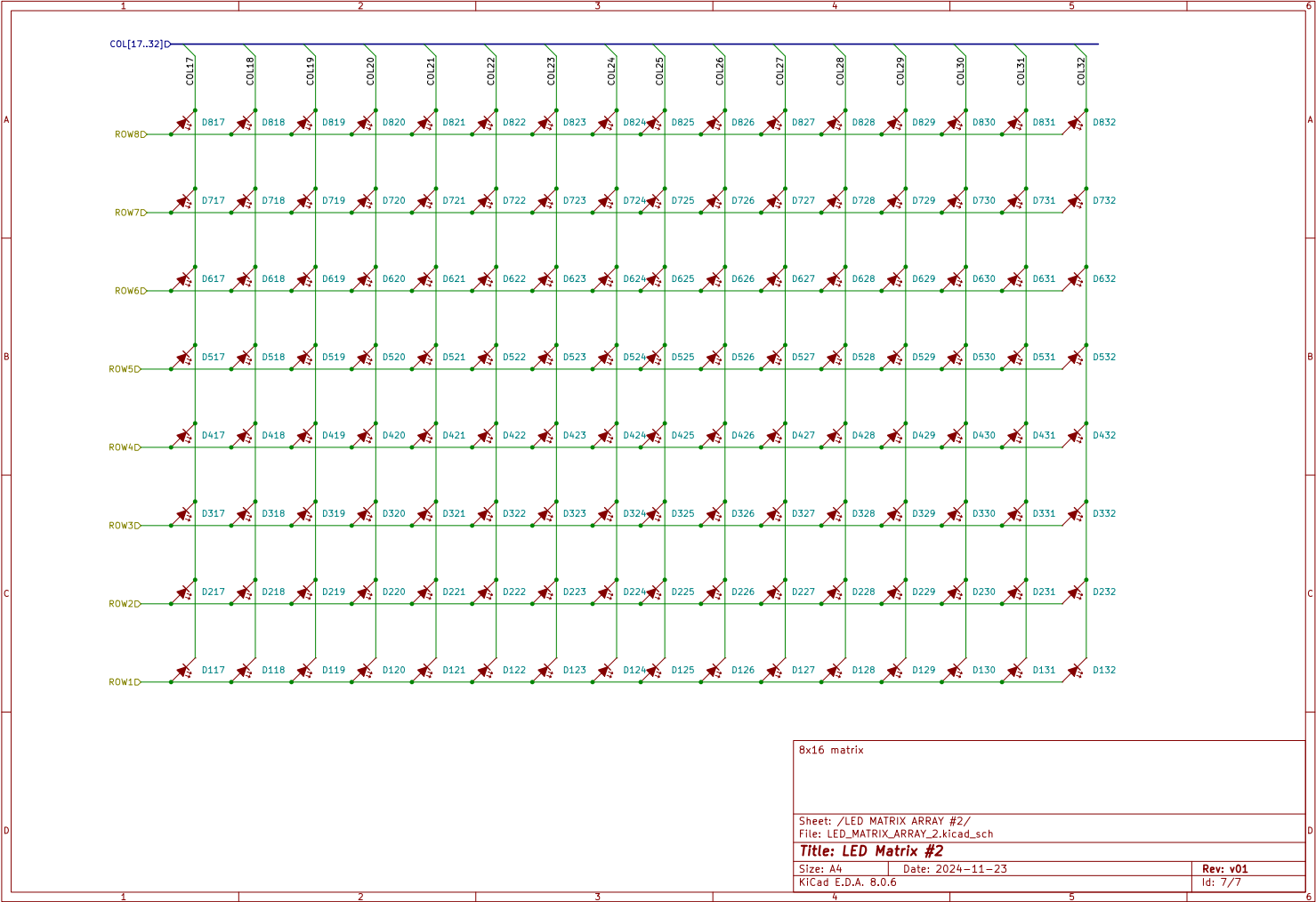
COL[1..16]

COL1 COL2 COL3 COL4 COL5 COL6 COL7 COL8 COL9 COL10 COL11 COL12 COL13 COL14 COL15 COL16

ROW8  D801 D802 D803 D804 D805 D806 D807 D808 D809 D810 D811 D812 D813 D814 D815 D816

ROW7  D701 D702 D703 D704 D705 D706 D707 D708 D709 D710 D711 D712 D713 D714 D715 D716

ROW6  D601 D602 D603 D604 D605 D606 D607 D608 D609 D610 D611 D612 D613 D614 D615 D616

ROW5  D501 D502 D503 D504 D505 D506 D507 D508 D509 D510 D511 D512 D513 D514 D515 D516

ROW4  D401 D402 D403 D404 D405 D406 D407 D408 D409 D410 D411 D412 D413 D414 D415 D416

ROW3  D301 D302 D303 D304 D305 D306 D307 D308 D309 D310 D311 D312 D313 D314 D315 D316

ROW2  D201 D202 D203 D204 D205 D206 D207 D208 D209 D210 D211 D212 D213 D214 D215 D216

ROW1  D101 D102 D103 D104 D105 D106 D107 D108 D109 D110 D111 D112 D113 D114 D115 D116

COL[17..32]

COL17 COL18 COL19 COL20 COL21 COL22 COL23 COL24 COL25 COL26 COL27 COL28 COL29 COL30 COL31 COL32

ROW8 — D817 D818 D819 D820 D821 D822 D823 D824 D825 D826 D827 D828 D829 D830 D831 D832

ROW7 — D717 D718 D719 D720 D721 D722 D723 D724 D725 D726 D727 D728 D729 D730 D731 D732

ROW6 — D617 D618 D619 D620 D621 D622 D623 D624 D625 D626 D627 D628 D629 D630 D631 D632

ROW5 — D517 D518 D519 D520 D521 D522 D523 D524 D525 D526 D527 D528 D529 D530 D531 D532

ROW4 — D417 D418 D419 D420 D421 D422 D423 D424 D425 D426 D427 D428 D429 D430 D431 D432

ROW3 — D317 D318 D319 D320 D321 D322 D323 D324 D325 D326 D327 D328 D329 D330 D331 D332

ROW2 — D217 D218 D219 D220 D221 D222 D223 D224 D225 D226 D227 D228 D229 D230 D231 D232

ROW1 — D117 D118 D119 D120 D121 D122 D123 D124 D125 D126 D127 D128 D129 D130 D131 D132

8x16 matrix