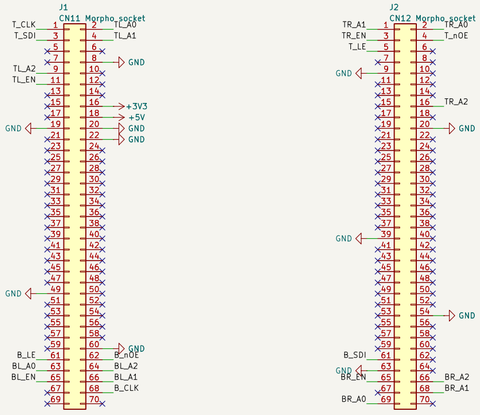
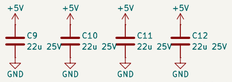
MCU: NUCLEO-144 ST MORPHO CN11 (J1) / CN12 (J2)



Morpho pin map (UM1974 Table 21):
CN11-1 PC10 T_CLK SPI3_SCK
CN11-2 PC11 T_A0
CN11-3 PC12 T_SDI SPI3_MOSI
CN11-4 PD2 T_A1
CN11-9 PF6 TL_A2
CN11-11 PF7 TL_EN
CN11-61 PE1 B_LE
CN11-62 PE6 B_nOE TIM9_CH2
CN11-63 PG9 BL_A0
CN11-64 PG15 BL_A2
CN11-65 PG12 BL_EN
CN11-66 PG10 BL_A1

CN11-68 PG13 B_CLK SPI6_SCK
CN12-1 PC9 TR_A1
CN12-2 PC8 TR_A0
CN12-3 PB8 TR_EN
CN12-4 PC6 T_nOE TIM3_CH1
CN12-5 PB7 T_LE
CN12-16 PB12 TR_A2
CN12-61 PG14 B_SDI SPI6_MOSI
CN12-65 PD10 BR_EN
CN12-66 PG8 BR_A2
CN12-68 PG5 BR_A1
CN12-69 PG4 BR_A0

LED SUPPLY: Nucleo +5V (CN11-18)



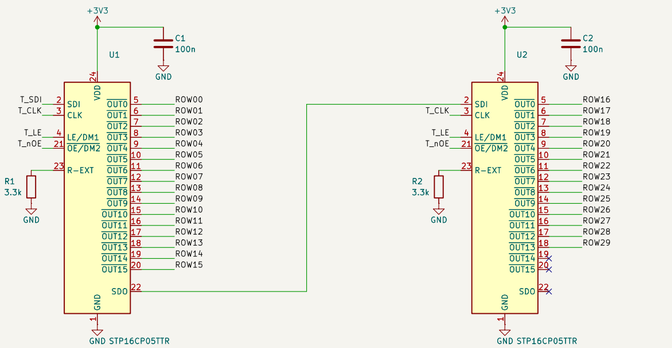
+5V bulk: two at each switch row (C9 C10 top band, C11 C12 bottom band)

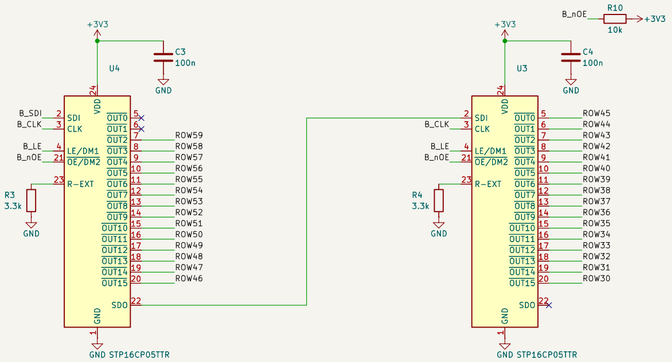
The LEDs, switches and decoders run from the Nucleo +5V. One column at a time is on: up to 60 x 5.7 mA = 341 mA. USB-powered Nucleo: 300 mA for everything -> keep the lit pixels per column moderate, or power the Nucleo from E5V / VIN (JP3) for full-white images. The STP16 logic runs from +3V3 (MCU levels).

ERC power flags



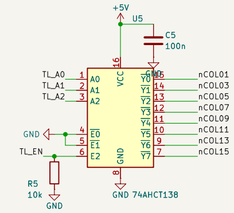
ROW DRIVERS: 4x STP16CP05, 16-ch constant-current sinks, I_LED = 18.75 V / R_EXT

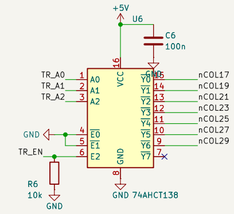


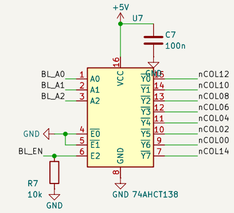


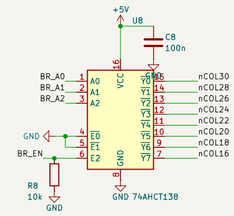
Chains: T_SDI -> U1 -> U2 (top band, rows 0-29); B_SDI -> U4 -> U3 (bottom band, rows 30-59).
R_EXT 3.3k: 5.7 mA per LED, up to 60 x 5.7 = 341 mA in one column.
Row-to-output map: export/matrix_map.csv

COLUMN DECODERS: 4x 74AHCT138 (5 V, TTL inputs), active-low gates



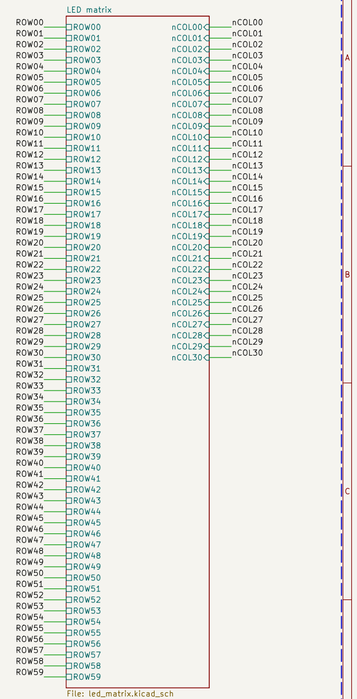






A0-A2 select Yn; EN (E3, active high, 10k pull-down) enables one decoder at a time.
Column c: band T if c even (U5 / U6), band B if odd (U7 / U8); see export/matrix_map.csv

LED MATRIX SHEET



NOTES, FIDUCIALS



Scanning: one column at a time (31 columns, 1/31 duty). For column c: shift the row data into both chains (T_SDI / B_SDI), blank with nOE, latch with LE, select the column (band, decoder, A0-A2, EN), unblank.
Average LED current = I_LED / 31. The shield has no mounting holes: the LED field covers the whole board; it is held by the two 2x35 morpho sockets (solder the CN11/CN12 headers on the Nucleo first).
Socket height must clear the Nucleo-144 Zio headers: use 8.5 mm sockets on 11 mm (or longer) pins.

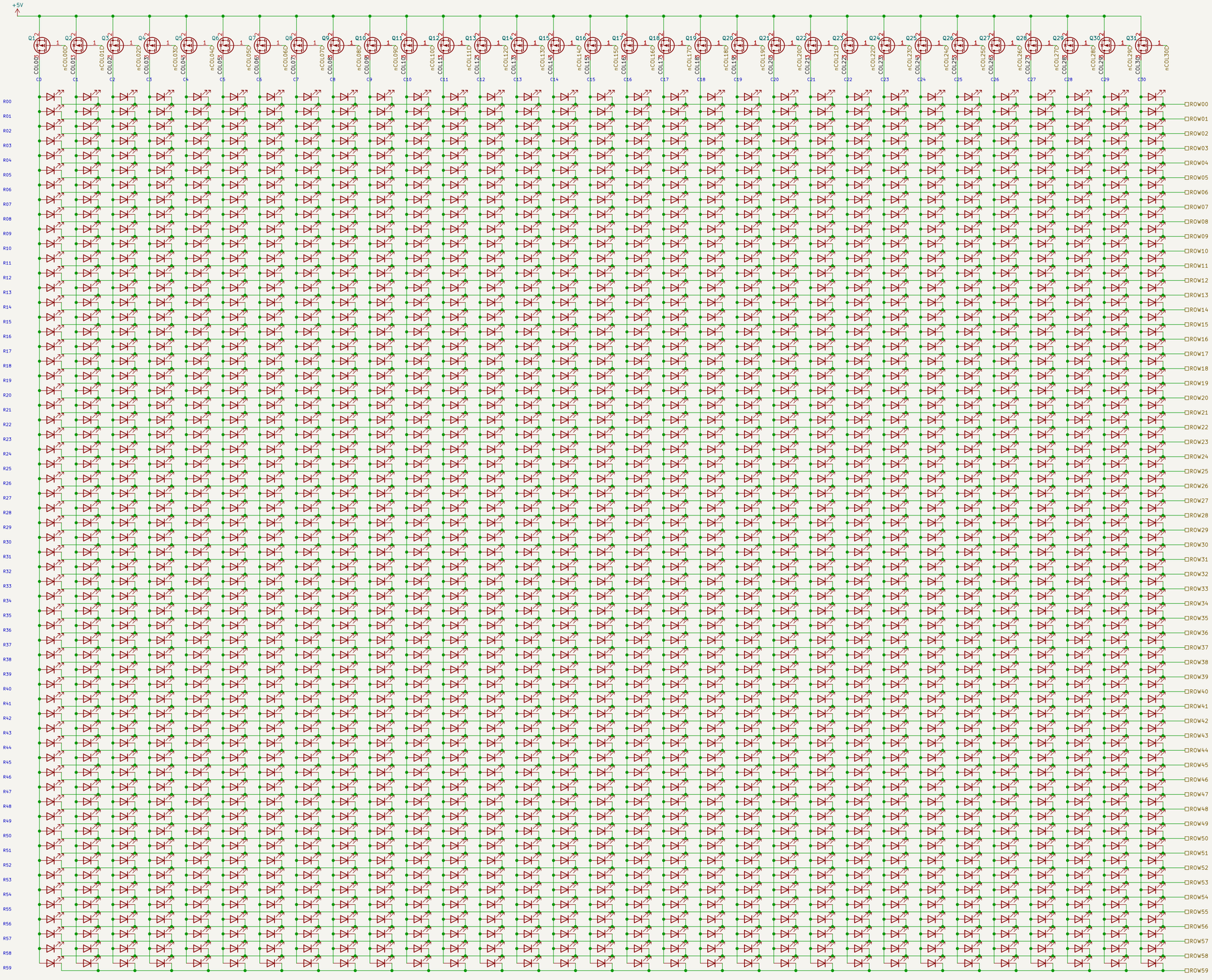
Host: NUCLEO-F429ZI / F767ZI (Nucleo-144, ST morpho CN11/CN12)
Rows: 4x STP16CP05 constant-current sinks; columns: 31x AO3401A high-side switches, 4x 74AHCT138
31 x 60 = 1860 red 0402 LEDs at 1.75 mm pitch, 45-degree placement

Sheet: /
File: nucleo144_led_matrix_shield.kicad_sch

Title: Nucleo-144 LED matrix shield

Size: A2	Date: 2026-11-02	**Rev: 3**
KiCad E.D.A. 10.0.4		Id: 1/2

LED MATRIX: 31 columns (anodes, switched to +5V) x 60 rows (cathodes, sunk by STP16CP05)



Each LED: anode on its column wire, cathode on its row wire. Reference = D<column 1–31><row 01–60>.
e.g. D1207 = column 11 (C11), row 06 (R06). Layout: LEDs at –45 deg, pitch 1.75 mm: rows on F.Cu, columns on B.Cu,
row lanes on In2 (top half to the top band, bottom half to the bottom band). In1 = GND plane.

Host: NUCLEO–F429ZI / F767ZI (Nucleo–144, ST morpho CN11/CN12)
Rows: 4x STP16CP05 constant–current sinks; columns: 31x AO3401A high–side switches, 4x 74AHCT1
31 x 60 = 1860 red 0402 LEDs at 1.75 mm pitch, 45–degree placement

Sheet: /LED matrix/
File: led_matrix.kicad_sch

Title: LED matrix 31 x 60

Size: A2	Date: 2026–11–02	**Rev: 3**
KiCad E.D.A. 10.0.4		Id: 2/2