UI_POT

| | |
|---|---|
| OUT_0 | ANA_0 |
| OUT_1 | ANA_1 |
| OUT_2 | ANA_2 |
| OUT_3 | ANA_3 |
| OUT_4 | ANA_4 |
| OUT_5 | ANA_5 |
| OUT_6 | ANA_6 |
| OUT_7 | ANA_7 |
| OUT_8 | ANA_8 |
| OUT_9 | ANA_9 |
| OUT_10 | ANA_10 |
| OUT_11 | ANA_11 |

File: UI_POT.kicad_sch

UI_BUTTON

| | |
|---|---|
| OUT_12 | ANA_12 |
| OUT_13 | ANA_13 |
| OUT_14 | ANA_14 |
| OUT_15 | ANA_15 |

File: UI_BUTTON.kicad_sch

UI_LED

LED_DATA_IN

LED_DATA_OUT

File: UI_LED.kicad_sch

MCU

LED_DATA_OUT

HWCFG_SHIFT
HWCFG_CLOCK

HWCFG_DATA

File: MCU.kicad_sch

HWCFG

HWCFG_SHIFT
HWCFG_CLOCK

HWCFG_DATA

File: HWCFG.kicad_sch

Common Sheets:
500 GRID
600 USB_POWER
700 MCU

Module Specific:
800 HWCFG
900 LED
1000 UI

Sheet5D7C8BFD

| | |
|---|---|
| ANA_0 | IN_0 |
| ANA_1 | IN_1 |
| ANA_4 | IN_2 |
| ANA_5 | IN_3 |
| ANA_8 | IN_4 |
| ANA_9 | IN_5 |
| ANA_12 | IN_6 |
| ANA_13 | IN_7 |

OUT — ESP_GPIO_1 / ESP_GPIO_18

ADDRESS_A — ESP_GPIO_37
ADDRESS_B — ESP_GPIO_36
ADDRESS_C — ESP_GPIO_35

File: UI_MUX.kicad_sch

sheet5D8763D6

| | |
|---|---|
| ANA_2 | IN_0 |
| ANA_3 | IN_1 |
| ANA_6 | IN_2 |
| ANA_7 | IN_3 |
| ANA_10 | IN_4 |
| ANA_11 | IN_5 |
| ANA_14 | IN_6 |
| ANA_15 | IN_7 |

OUT — ESP_GPIO_2

ADDRESS_A — ESP_GPIO_5
ADDRESS_B — ESP_GPIO_4
ADDRESS_C — ESP_GPIO_3

File: UI_MUX.kicad_sch

Sheet: /
File: PCBA-PBF4.kicad_sch

Title:

Size: A3          Date:
KiCad E.D.A. 8.0.5

Rev:
Id: 1/10

# 1000

P090S-04F20BR10K (NF)
UI1001
P090S-04F20BR10K (NF) UI1003
P090S-04F20BR10K (NF)
UI1005
P090S-04F20BR10K (NF) UI1007
P090S-04F20BR10K (NF)

+3V3  +3V3  +3V3  +3V3

R1017 470R  R1019 470R  R1021 470R  R1023 470R

1 2 3

OUT_0  GND
OUT_1  GND
OUT_2  GND
OUT_3  GND

PS30-10MC1BR10K (NF)
+3V3
PS30-10MC1BR10K (NF)
+3V3
PS30-10MC1BR10K (NF)
+3V3
PS30-10MC1BR10K (NF)
+3V3

R1018 470R  R1020 470R  R1022 470R  R1024 470R

1 2 3

UI1002  UI1004  UI1006  UI1008

OUT_4  GND
OUT_5  GND
OUT_6  GND
OUT_7  GND

OUT_8  GND
OUT_9  GND
OUT_10  GND
OUT_11  GND

1000

UI1009
B3F-4050 (NF)

+3V3

R1025
10k

4    3    OUT_12
2    1

GND    GND

UI1010
B3F-4050 (NF)

+3V3

R1026
10k

OUT_13    4    3
2    1

GND    GND

UI1011
B3F-4050 (NF)

+3V3

R1027
10k

4    3    OUT_14
2    1

GND    GND

UI1012
B3F-4050 (NF)

+3V3

R1028
10k

OUT_15    4    3
2    1

GND    GND

Sheet: /UI_BUTTON/
File: UI_BUTTON.kicad_sch

Title:

Size: A4    Date:    Rev:

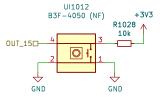KiCad E.D.A. 8.0.5    Id: 3/10

**900**

LED_DATA_IN

+5V  C901  100n  D901  GND
+5V  C904  100n  D904  GND
+5V  C907  100n  D907  GND
+5V  C910  100n  D910  GND

DIN DOUT VDD VSS RGB  GND (×4)

+5V  C902  100n  D902  GND
+5V  C905  100n  D905  GND
+5V  C908  100n  D908  GND
+5V  C911  100n  D911  GND

DIN DOUT VDD VSS RGB  GND (×4)

+5V  C903  100n  D903  GND
+5V  C906  100n  D906  GND
+5V  C909  100n  D909  GND
+5V  C912  100n  D912  GND

DIN DOUT VDD VSS RGB  GND (×4)

LED_DATA_OUT

# 1000

R1001
1k
IN_0 —

C1001
100n
GND

R1005
1k
IN_1 —

C1005
100n
GND

R1002
1k
IN_2 —

C1002
100n
GND

R1006
1k
IN_3 —

C1006
100n
GND

R1003
1k
IN_4 —

C1003
100n
GND

R1007
1k
IN_5 —

C1007
100n
GND

R1004
1k
IN_6 —

C1004
100n
GND

R1008
1k
IN_7 —

C1008
100n
GND

+3V3

| 16 | VDD | | |
| 13 | X0 | X | 3 — DOUT |
| 14 | X1 | | |
| 15 | X2 | | |
| 12 | X3 | | |
| 1 | X4 | | |
| 5 | X5 | | |
| 2 | X6 | | |
| 4 | X7 | | |
| 6 | Inh | | |
| 11 | A | | |
| 10 | B | | |
| 9 | C | | |

U1001
74HC4051

ADDRESS_A
ADDRESS_B
ADDRESS_C

VSS  VEE
8    7

GND

+3V3

C1009
100n

GND

1000

R1009
1k
IN_0

C1010
100n
GND

R1013
1k
IN_1

C1014
100n
GND

R1010
1k
IN_2

C1011
100n
GND

R1014
1k
IN_3

C1015
100n
GND

R1011
1k
IN_4

C1012
100n
GND

R1015
1k
IN_5

C1016
100n
GND

R1012
1k
IN_6

C1013
100n
GND

R1016
1k
IN_7

C1017
100n
GND

+3V3

U1002
74HC4051

16 VDD
13 X0
14 X1
15 X2
12 X3
1 X4
5 X5
2 X6
4 X7
3 X    DOUT

6 Inh
11 A
10 B
9 C

ADDRESS_A
ADDRESS_B
ADDRESS_C

VSS VEE
8   7

GND

+3V3

C1018
100n

GND

700

Sheet60F06FE1

USB_DP → USB_DATA_P
USB_DN → USB_DATA_N

File: USB_POWER.kicad_sch

+3V3   +3V3 VDD_SPI +3V3        +3V3
GZ2012D601TF   PWR_FLAG
L702

C743  C746 C747 C749   C751   C752   C753 C754
10u   1u  100n 100n   100n   100n   10n  1u
GND   GND GND  GND     GND    GND    GND  GND

ESP32-S3

J701
C5137195                                    ESP_RESET   4  CHIP_PU      *GPIO0   5   ESP_BOOT0
L701                                         ESP_LNA    1  LNA_IN        GPIO1   6   ESP_GPIO_1
U.FL-R-SMT-1(80)   1n8        ESP_LNA                                    GPIO2   7   ESP_GPIO_2
                                             USB_DN    25  GPIO19 D-    *GPIO3   8   ESP_GPIO_3
        C739  C742                           USB_DP    26  GPIO20 D+     GPIO4   9   ESP_GPIO_4
        3p9   1p8                                                        GPIO5   10  ESP_GPIO_5
        GND   GND                            SPIHD     28  GPIO26 SPICS1 GPIO6   11  RP_SPIO_RX
                                             SPIWP     30  GPIO27 SPIHD  GPIO7   12  RP_SPIO_CS
1.8nH  LQG15HS1N8S02D                        SPICS0    31  GPIO28 SPIWP  GPIO8   13  RP_SPIO_TX
3.9pF  GJM1555C1H3R9WB01D                               32  GPIO29 SPICS0 GPIO9   14  RP_SPIO_SCK
1.8pF  GJM1555C1H1R8BB01D                    SPICLK    33  GPIO30 SPICLK GPIO10  15  HWCFG_SHIFT
                                             SPIQ      34  GPIO31 SPIQ   GPIO11  16  HWCFG_CLOCK
                                             SPID      35  GPIO32 SPID   GPIO12  17  HWCFG_DATA
40MHz                                                                    GPIO13  18  RP_SWDIO
Y701                                         XTAL_P    54                GPIO14  19  RP_SWCLK
                                                                         GPIO15  21  RP_CLK
                                                                         GPIO16  22  ESP_GPIO_16
                                             XTAL_N    53                GPIO17  23  RP_INTERRUPT
        C748  C750                                                       GPIO18  24  ESP_GPIO_18
        10p   10p
                                                                         GPIO21  27  LED_DATA_OUT
        GND   GND
LCSC:                                                                    GPIO33  38  ESP_GPIO_33
TXM40M0004322HBCEO00T                                                    GPIO34  39  ESP_GPIO_34
S3240000091040JY                                                         GPIO35  40  ESP_GPIO_35
                                             TCK       44  GPIO39 MTCK   GPIO36  41  ESP_GPIO_36
                                             TDO       45  GPIO40 MTDO   GPIO37  42  ESP_GPIO_37
                                             TDI       47  GPIO41 MTDI   GPIO38  43
                                             TMS       48  GPIO42 MTMS  *GPIO45  51  ESP_GPIO_45
                                             UOTXD     49  GPIO43 UOTXD *GPIO46  52  ESP_GPIO_46
                                             UORXD     50  GPIO44 UORXD  GPIO47  37  ESP_GPIO_47
                                                                         GPIO48  36  ESP_GPIO_48
                                                        57  GND
                                                            U704

ESP_GPIO_47 → TP706  TestPoint
ESP_GPIO_48 → TP707  TestPoint
ESP_GPIO_34 → TP708  TestPoint
ESP_GPIO_33 → TP709  TestPoint
                  TP710  TestPoint
GND

RP_UARTO_TX   TMS
RP_UARTO_RX   TCK
              TDO
UOTXD  R733   TDI
UORXD  1k
Conn_02x05_Odd_Even
J702
GND

Mapmode switch
This pushbutton is acessible through the housing,
activates USB bootloader.

+3V3  +3V3
R701  100n  R736  SW701
5k1   C757  1k    C255807
MAP_MODE
Internal Pull-up
GND

+3V3
R735  SW702
5k1   C2905169
ESP_RESET
C758
1u
GND   GND

SW703
C2905169
ESP_BOOT0
GND

+1V1   +3V3
C731 C732 C733   C734 C735 C736 C737 C738 C740 C741 C744 C745
100n 100n 1u     1u   100n 100n 100n 100n 100n 100n 100n 100n
GND  GND  GND    GND  GND  GND  GND  GND  GND  GND  GND  GND

+3V3
R729
5k1
RP_RUN    26  RUN         GPIO0   RP_UARTO_TX
              45 VREG_VOUT GPIO1   RP_UARTO_RX
              47  USB_DP    GPIO2 4  GRID_SOUTH_TX
              46  USB_DM    GPIO3 5  GRID_WEST_RX
                            GPIO4 6  GRID_SYNC_2
              56  QSPI_SS   GPIO5 7  GRID_WEST_TX
              53  QSPI_SD0  GPIO6 8  GRID_NORTH_RX
              55  QSPI_SD1  GPIO7 9
              54  QSPI_SD2  GPIO8 10
              51  QSPI_SD3  GPIO9 11
              52  QSPI_SCLK GPIO10 12
                            GPIO11 13
                            GPIO12 14  TP701 TestPoint
                            GPIO13 16  TP702 TestPoint
                            GPIO14 17  TP703 TestPoint
                            GPIO15 18  TP704 TestPoint
              20  XIN       GPIO16 27  RP_SPIO_RX
                            GPIO17 28  RP_SPIO_CS
                            GPIO18 29  RP_SPIO_SCK
                            GPIO19 30  RP_SPIO_TX
              21  XOUT      GPIO20 31
                            GPIO21 32
                            GPIO22 34  RP_INTERRUPT
                            GPIO23 35  GRID_NORTH_TX
              24  SWCLK     GPIO24 36  GRID_EAST_RX
              25  SWD       GPIO25 37  GRID_SYNC_1
                            GPIO26_ADC0 38  GRID_EAST_TX
              19  TESTEN    GPIO27_ADC1 39  GRID_SOUTH_RX
                            GPIO28_ADC2 40
              57  GND       GPIO29_ADC3 41
                  U703
                  RP2040
GND

GRID Connector
Connector arrays for the interface boards on
all four sides of the module.

sheet5D85C9EA
GRID_SYNC_1   GRID_WEST_SYNC_1
GRID_WEST_TX  GRID_WEST_TX
GRID_WEST_RX  GRID_WEST_RX
GRID_SYNC_2   GRID_WEST_SYNC_2

GRID_SYNC_1   GRID_SOUTH_SYNC_1
GRID_SOUTH_TX GRID_SOUTH_TX
GRID_SOUTH_RX GRID_SOUTH_RX
GRID_SYNC_2   GRID_SOUTH_SYNC_2

GRID_SYNC_1   GRID_EAST_SYNC_1
GRID_EAST_TX  GRID_EAST_TX
GRID_EAST_RX  GRID_EAST_RX
GRID_SYNC_2   GRID_EAST_SYNC_2

GRID_SYNC_1   GRID_NORTH_SYNC_1
GRID_NORTH_TX GRID_NORTH_TX
GRID_NORTH_RX GRID_NORTH_RX
GRID_SYNC_2   GRID_NORTH_SYNC_2

File: GRID.kicad_sch

J799
Conn_01x02
GND

QSPI Flash memory
This memory can be accessed throgh the QSPI interface
of the MCU. Can be used for configuration, static data or
program execution.

VDD_SPI   VDD_SPI
R734            U705
5k1             W25Q64JVSSIQ
SPICS0   CS   DI(IO0)  SPID
         VCC  DO(IO1)  SPIQ
SPICLK   CLK  IO2      SPIWP
         GND  IO3      SPIHD
VDD_SPI VDD_SPI
C755  C756
1u    100n
GND   GND        GND

**500**

GRID Connector
Bi-Directional Data
2x SYNC

Board Mounting Pattern

M501 Conn_01x08

J501 Conn_01x04
+5V  GRID_NORTH_SYNC_2  GRID_NORTH_RX  GND

J502 Conn_01x04
GND  GRID_NORTH_TX  GRID_NORTH_SYNC_1  +5V

J504 Conn_01x04
+5V
GRID_WEST_SYNC_1
GRID_WEST_TX
GND

J506 Conn_01x04
GND
GRID_WEST_RX
GRID_WEST_SYNC_2
+5V

J503 Conn_01x04
+5V
GRID_EAST_SYNC_2
GRID_EAST_RX
GND

J505 Conn_01x04
GND
GRID_EAST_TX
GRID_EAST_SYNC_1
+5V

J507 Conn_01x04
+5V  GRID_SOUTH_SYNC_1  GRID_SOUTH_TX  GND

J508 Conn_01x04
GND  GRID_SOUTH_RX  GRID_SOUTH_SYNC_2  +5V

# 600

## ESD Diodes

ESD protection for all of the externally accessible nets.

VBUS

U601
C5451661

USB_DATA_N

USB_DATA_P

GND

TP601
GND

TP602
VB

VBUS

GND

TP603
D−

TP604
D+

USB_DATA_P

USB_DATA_N

## +3V3 LDO Regulators

Regulators for generating independent power rails for the microcontroller and the user interface.

VBUS +5V

GZ2012D601TF
L601

PWR_FLAG

U602
LN1134A332MR−G

IN    OUT
EN    NC
GND

C601
1u

GND

C602
1u

GND

+3V3

UI
TP605

J601
TYPE−C−32−M−12

PWR_FLAG    VBUS

VBUS    A9B4
VBUS    A4B9

CC1    A5
CC2    B5

D−    A7
D−    B7
D+    A6
D+    B6

USB_DATA_N
USB_DATA_P

SBU1    A8
SBU2    B8

PWR_FLAG

GND    A1B12
GND    A12B1

GND

SHIELD  SHIELD  SHIELD  SHIELD

S1  S2  S3  S4

C603
4n7

R603
1M

GND    GND

GND
5k1
R601

GND
5k1
R602

**800**

U801
74HC165

| Pin | Signal |
|---|---|
| 10 | SI |
| 11 | D0 — HWCFG_LOW |
| 12 | D1 — HWCFG_HIGH |
| 13 | D2 — HWCFG_LOW |
| 14 | D3 — HWCFG_LOW |
| 3 | D4 — HWCFG_LOW |
| 4 | D5 — HWCFG_LOW |
| 5 | D6 — HWCFG_LOW |
| 6 | D7 — HWCFG_HIGH |

VCC (16) — +3V3
Q (9) — HWCFG_DATA
Q̄ (7) — ✗

2  CLK — HWCFG_CLOCK
15 INH
1  SH/LD — HWCFG_SHIFT
8  GND — GND

C801
100n
+3V3 — HWCFG_HIGH
— HWCFG_LOW
GND

Board Identification

Grid firmware can identify the hardware and the board
revision thorugh a 3 wire serial interface using one
or more shift register as read only memory. The content
of the memory is defined by pulling the inputs high or
low through pcb traces or solderable configuration jumpers.

4b'Model + 4b'Revision + nb'Reserved (Multiple shift registers)

D0: MODEL (LSB)
D1: MODEL
D2: MODEL
D3: MODEL (MSB)
D4: REVISION (LSB)
D5: REVISION
D6: REVISION
D7: REVISION (MSB)

Model Codes (D3-D0):

Po16 0000
Bo16 0001
PBF4 0010
EN16 0011
...

Revision Codes (D7-D4):

RevA 0000
RevB 0001
RevC 0010
RevD 0011
...