USB DFU requires stable levels on PA10, PB5, PB11 & PC11. PB2 must be low during boot.

R12, R13, R20 & R21 provide stable input levels for DFU.

U1A

PA0-WKUP(PA0)/USART2_CTS/UART4_TX/ETH_MII_CRS/TIM2_CH1_ETR/TIM5_CH1/TIM8_ETR/EVENTOUT/ADC123_IN0/WKUP
PA1/USART2_RTS/UART4_RX/ETH_RMII_REF_CLK/ETH_MII_RX_CLK/TIM5_CH2/TIM2_CH2/EVENTOUT/ADC123_IN1
PA2/USART2_TX/TIM5_CH3/TIM9_CH1/TIM2_CH3/ETH_MDIO/EVENTOUT/ADC123_IN2
PA3/USART2_RX/TIM5_CH4/TIM9_CH2/TIM2_CH4/OTG_HS_ULPI_D0/ETH_MII_COL/EVENTOUT/ADC123_IN3
PA4/SPI1_NSS/SPI3_NSS/USART2_CK/DCMI_HSYNC/OTG_HS_SOF/I2S3_WS/EVENTOUT/ADC12_IN4/DAC_OUT1
PA5/SPI1_SCK/OTG_HS_ULPI_CK/TIM2_CH1_ETR/TIM8_CH1N/EVENTOUT/ADC12_IN5/DAC_OUT2
PA6/SPI1_MISO/TIM8_BKIN/TIM13_CH1/DCMI_PIXCLK/TIM3_CH1/TIM1_BKIN/EVENTOUT/ADC12_IN6
PA7/SPI1_MOSI/TIM8_CH1N/TIM14_CH1/TIM3_CH2/ETH_MII_RX_DV/TIM1_CH1N/ETH_RMII_CRS_DV/EVENTOUT/ADC12_IN7
PA8/MCO1/USART1_CK/TIM1_CH1/I2C3_SCL/OTG_FS_SOF/EVENTOUT
PA9/USART1_TX/TIM1_CH2/I2C3_SMBA/DCMI_D0/EVENTOUT/OTG_FS_VBUS
PA10/USART1_RX/TIM1_CH3/OTG_FS_ID/DCMI_D1/EVENTOUT
PA11/USART1_CTS/CAN1_RX/TIM1_CH4/OTG_FS_DM/EVENTOUT
PA12/USART1_RTS/CAN1_TX/TIM1_ETR/OTG_FS_DP/EVENTOUT
PA13(JTMS-SWDIO)/JTMS-SWDIO/EVENTOUT
PA14(JTCK-SWCLK)/JTCK-SWCLK/EVENTOUT
PA15(JTDI)/JTDI/SPI3_NSS/I2S3_WS/TIM2_CH1_ETR/SPI1_NSS/EVENTOUT

PB0/TIM3_CH3/TIM8_CH2N/OTG_HS_ULPI_D1/ETH_MII_RXD2/TIM1_CH2N/EVENTOUT/ADC12_IN8
PB1/TIM3_CH4/TIM8_CH3N/OTG_HS_ULPI_D2/ETH_MII_RXD3/TIM1_CH3N/EVENTOUT/ADC12_IN9
PB2-BOOT1(PB2)/EVENTOUT
PB3(JTDO/TRACESWO)/JTDO/TRACESWO/SPI3_SCK/I2S3_CK/TIM2_CH2/SPI1_SCK/EVENTOUT
PB4(NJTRST)/NJTRST/SPI3_MISO/TIM3_CH1/SPI1_MISO/I2S3ext_SD/EVENTOUT
PB5/I2C1_SMBA/CAN2_RX/OTG_HS_ULPI_D7/ETH_PPS_OUT/TIM3_CH2/SPI1_MOSI/SPI3_MOSI/DCMI_D10/I2S3_SD/EVENTOUT
PB6/I2C1_SCL/TIM4_CH1/CAN2_TX/DCMI_D5/USART1_TX/EVENTOUT
PB7/I2C1_SDA/FSMC_NL/DCMI_VSYNC/USART1_RX/TIM4_CH2/EVENTOUT
PB8/TIM4_CH3/SDIO_D4/TIM10_CH1/DCMI_D6/ETH_MII_TXD3/I2C1_SCL/CAN1_RX/EVENTOUT
PB9/SPI2_NSS/I2S2_WS/TIM4_CH4/TIM11_CH1/SDIO_D5/DCMI_D7/I2C1_SDA/CAN1_TX/EVENTOUT
PB10/SPI2_SCK/I2S2_CK/I2C2_SCL/USART3_TX/OTG_HS_ULPI_D3/ETH_MII_RX_ER/TIM2_CH3/EVENTOUT
PB11/I2C2_SDA/USART3_RX/OTG_HS_ULPI_D4/ETH_RMII_TX_EN/ETH_MII_TX_EN/TIM2_CH4/EVENTOUT
PB12/SPI2_NSS/I2S2_WS/I2C2_SMBA/USART3_CK/TIM1_BKIN/CAN2_RX/OTG_HS_ULPI_D5/ETH_RMII_TXD0/ETH_MII_TXD0/OTG_HS_ID/EVENTOUT
PB13/SPI2_SCK/I2S2_CK/USART3_CTS/TIM1_CH1N/CAN2_TX/OTG_HS_ULPI_D6/ETH_RMII_TXD1/ETH_MII_TXD1/EVENTOUT/OTG_HS_VBUS
PB14/SPI2_MISO/TIM1_CH2N/TIM12_CH1/OTG_HS_DM/USART3_RTS/TIM8_CH2N/I2S2ext_SD/EVENTOUT
PB15/SPI2_MOSI/I2S2_SD/TIM1_CH3N/TIM8_CH3N/TIM12_CH2/OTG_HS_DP/EVENTOUT/RTC_REFIN

STM32F405RGT6

PA0-X1, PA1-X2, PA2-X3, PA3-X4, PA4-X5, PA5-X6, PA6-X7, PA7-X8, PA8-SDIO_SW, PA9-VBUS, PA10-ID, PA11-DM, PA12-DP, PA13-RED-P5, PA14-GRN-P4, PA15-YEL-P3

PB0-Y11, PB1-Y12, PB2-BOOT1-MMA-INT, PB3-SW-X17, PB4-BLU-P2, PB5-MMA_AVDD, PB6-SCL-X9, PB7-SDA-X10, PB8-Y3, PB9-Y4, PB10-Y9, PB11-Y10, PB12-Y5, PB13-Y6, PB14-Y7, PB15-Y8

3V3 — R21 100k — uSD — USB

3V3 — I2C pullups — R9 4k7, R8 4k7

I2C pullups — R11 4k7, R12 4k7

R20 100k, R14 100k — GND

J8 MicroSD PUSH-PULL

PC10-SDIO_D2, PC11-SDIO_D3, PD2-SDIO_CMD, PC12-SDIO_CK, PC8-SDIO_D0, PC9-SDIO_D1

DAT2, CD/DAT3, CMD, VDD, CLK, GND, DAT0, DAT1, SWITCH, SWITCH, MOUNT, MOUNT, G4, G3, G2, G1

MicroSD — GND — PA8-SDIO_SW

3V3 — C18 4u7 — GND

Q1 prevents VBUS (5V) from overcharging Lion / Lipo batteries.

J10 Battery — VBAT — DMP2160UW Q1 — V+

U4 DNF MIC2005A-1YM5

IN, OUT, EN, FAULT#, GND

V+ — B — R22 100k — D1 MSE1PB-M3/89A — VBUS

Fit U4 for USB OTG. V+ must be 5V

Blue LED will indicate host mode if OTG enabled.

PA9-VBUS — R10 560R

PA11-DM — R1 22R — DM

PA12-DP — R2 22R — DP

PA10-ID — R16 560R — ID

J9 CON-USB-MICROAB

VBUS, DM, DP, ID, GND, MH1, MH2, MH3, MH4

U1B

PC0/OTG_HS_ULPI_STP/EVENTOUT/ADC123_IN10
PC1/ETH_MDC/EVENTOUT/ADC123_IN11
PC2/SPI2_MISO/OTG_HS_ULPI_DIR/ETH_MII_TXD2/I2S2ext_SD/EVENTOUT/ADC123_IN12
PC3/SPI2_MOSI/I2S2_SD/OTG_HS_ULPI_NXT/ETH_MII_TX_CLK/EVENTOUT/ADC123_IN13
PC4/ETH_RMII_RX_D0/ETH_MII_RX_D0/EVENTOUT/ADC12_IN14
PC5/ETH_RMII_RX_D1/ETH_MII_RX_D1/EVENTOUT/ADC12_IN15
PC6/I2S2_MCK/TIM8_CH1/SDIO_D6/USART6_TX/DCMI_D0/TIM3_CH1/EVENTOUT
PC7/I2S3_MCK/TIM8_CH2/SDIO_D7/USART6_RX/DCMI_D1/TIM3_CH2/EVENTOUT
PC8/TIM8_CH3/SDIO_D0/TIM3_CH3/USART6_CK/DCMI_D2/EVENTOUT
PC9/I2S_CKIN/MCO2/TIM8_CH4/SDIO_D1/I2C3_SDA/DCMI_D3/TIM3_CH4/EVENTOUT
PC10/SPI3_SCK/I2S3_CK/UART4_TX/SDIO_D2/DCMI_D8/USART3_TX/EVENTOUT
PC11/UART4_RX/SPI3_MISO/SDIO_D3/DCMI_D4/USART3_RX/I2S3ext_SD/EVENTOUT
PC12/UART5_TX/SDIO_CK/DCMI_D9/SPI3_MOSI/I2S3_SD/USART3_CK/EVENTOUT
PC13/EVENTOUT/RTC_OUT,RTC_TAMP1,RTC_TS
PC14-OSC32_IN(PC14)/EVENTOUT/OSC32_IN
PC15-OSC32_OUT(PC15)/EVENTOUT/OSC32_OUT

PD2/TIM3_ETR/UART5_RX/SDIO_CMD/DCMI_D11/EVENTOUT

STM32F405RGT6

PC0-X19, PC1-X20, PC2-X21, PC3-X22, PC4-X11, PC5-X12, PC6-Y1, PC7-Y2

3V3 — R13 100k — uSD

PC8-SDIO_D0, PC9-SDIO_D1, PC10-SDIO_D2, PC11-SDIO_D3, PC12-SDIO_CK

PC13-X18 — Y2 32.768 kHz — C12 2p2, C11 2p2 — GND

PD2-SDIO_CMD

CL = 2.2/2 + 5 (Cstray) = 6.1 pF

PB5-MMA_AVDD — C15 100n — GND

3V3 — C14 100n — GND

U3 MMA7660

RSRVD, N/C, AVDD, AVSS, INT, RSRVD, DVDD, DVSS, SDA, SCL

PB2-BOOT1-MMA-INT — PB7-SDA-X10 — PB6-SCL-X9

R19 prevents a silicon failure from short circuiting the backup battery.

3V3 — R3 4k7 — BOOT0-P1 — RST# — SW1 RST — C13 100n — GND

U1C

BOOT0/VPP, NRST, VCAP_1, VCAP_2, PH0-OSC_IN(PH0)/EVENTOUT/OSC_IN, PH1-OSC_OUT(PH1)/EVENTOUT/OSC_OUT

STM32F405RGT6

VCAP1, VCAP2 — R15 100k, C19 2u2, C20 2u2 — GND

N3, N4 — Y1 12 MHz — C1 10p, C2 10p — GND

CL = 10/2 + 5 (Cstray) = 10 pF

PA13-RED-P5 — R4 560R — R — D2 LED-RED

PA14-GRN-P4 — R6 560R — G — D3 LED-GREEN

PA15-YEL-P3 — R7 560R — Y — D4 LED-YELLOW

PB4-BLU-P2 — R5 220R — B — D5 LED-BLUE — GND

J6 Header 8-Y1Y8

PC6-Y1, PC7-Y2, PB8-Y3, PB9-Y4, PB12-Y5, PB13-Y6, PB14-Y7, PB15-Y8

VBACKUP — R19 220R — V+

J7 Header 8-Y9Y16

Y16, Y15, Y14, Y13, Y12, Y11, Y10, Y9 — RST#, PB1-Y12, PB0-Y11, PB11-Y10, PB10-Y9

J2 Header 8-X9X16

PB6-SCL-X9, PB7-SDA-X10, PC4-X11, PC5-X12, RST#

3V3 — V+ — GND

J4 Header 8-P1P8

BOOT0-P1, PB4-BLU-P2, PA15-YEL-P3, PA14-GRN-P4, PA13-RED-P5, VBACKUPIN

J5 Header 4X2-P9P10

P9D, P10D, P9C, P10C, P9B, P10B, P9A, P10A

J1 Header 8-X1X8

X8, X7, X6, X5, X4, X3, X2, X1 — PA7-X8, PA6-X7, PA5-X6, PA4-X5, PA3-X4, PA2-X3, PA1-X2, PA0-X1

J3

X17, X18, X19, X20, X21, X22, X23, X24 — PB3-SW-X17, PC13-X18, PC0-X19, PC1-X20, PC2-X21, PC3-X22 — A3V3 — GND

All pins are 5V tolerant except PA4 & PA5

Therefore X skin SPI is not 5V tolerant

PC13 is limited to 3mA out.

Test points for JTAG debug available on bottom connector

Note: LED resistors may need to be removed for debug (tbd).

V+ — U2 MCP1703 3V3 — IN, OUT, GND — C16 2u2, C17 4u7 — 3V3 — GND

3V3 — VBACKUP — C8 100n — GND

U1D STM32F405RGT6

VBAT, VDD, VDD, VDD, VDD, VSS, VSS, VDDA, VSSA

C7 4u7, C3 100n, C4 100n, C5 100n, C6 100n — GND

L1 1k — A3V3 — C10 4u7, C9 100n — GND

PB3-SW-X17 — R17 4k7 — USR-SW — SW2 USR — GND

Original design: Damien George	Project: Micro Python Board STM32F405 48pin.		
Revised by: Chris Mason	Title: Schematic		
(C) 2013, 2014 Damien P. George CC Attribution 3.0 Unported License	Size: A3	Number: PYBv1.1	Revision:
	Date: 29/09/2016 Time: 8:04:53 PM	Sheet 2 of 2	
File: L:_NEW_Projects\MICRO_PYTHON\PYB\PYB\PYBv11b\PYBv11b-sh2.SchDoc			

The Micro Python Board

pyboard

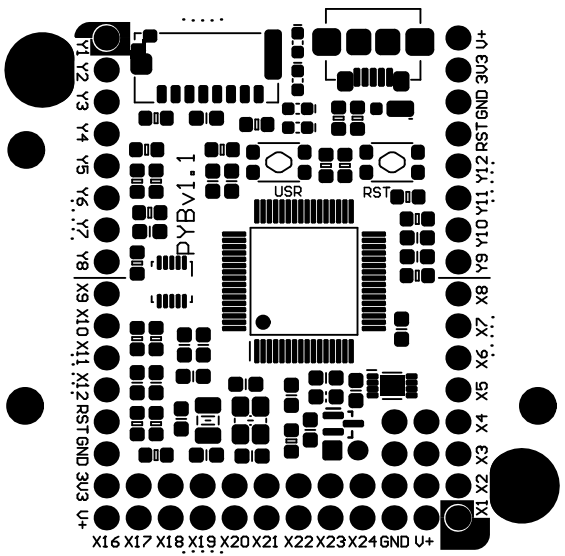
A project by Damien George

http://micropython.org

Note: Functions marked * are standardised symetrical functions.
No serial port on Y9 & Y10. Use PYB for 4 serial ports.
CANbus not available - use PYB.
MCU: STM32F411.

1.3in x 1.65in 33mm x 42mm

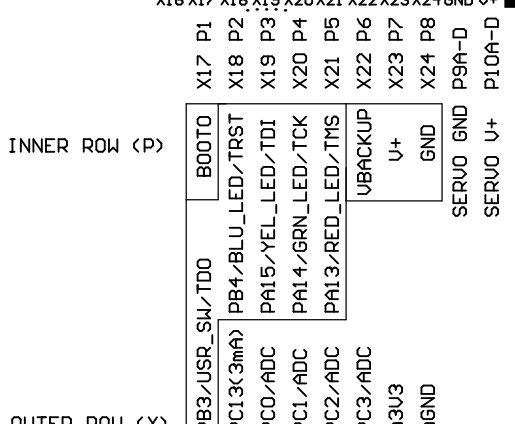
PC6/TX6*/PWM*	Y1
PC7/RX6*/PWM*	Y2
PB10/PWM*	Y3
PB9/PWM*	Y4
PB12/SS2*/CANRX2	Y5
PB13/SCK2*/CANTX2/PWM	Y6
PB14/MISO2*/PWM	Y7
PB15/MOSI2*/PWM	Y8
PB6/SCL1*/4k7PU/TXD1/PWM	X9
PB7/SDA1*/4k7PU/RXD1/PWM	X10
PC4/ADC*	X11
PC5/ADC*	X12
RST*	X13
GND	X14
3V3	X15
V+	X16



Y16	V+
Y15	3V3
Y14	GND
Y13	RST*
Y12	PB1/ADC*/PWM
Y11	PB0/ADC*/PWM
Y10	PB8/SDA3*/4k7PU/PWM
Y9	PA8/SCL3*/4k7PU/PWM
X8	PA7/MOSI1*/ADC/PWM
X7	PA6/MISO1*/ADC/PWM
X6	PA5/SCK1*/ADC/DAC/PWM (3V3)
X5	PA4/SS1*/ADC/DAC (3V3)
X4	PA1/ADC/PWM*/SERVO
X3	PA0/ADC/PWM*/SERVO
X2	PA3/RX2*/ADC/PWM*/SERVO
X1	PA2/TX2*/ADC/PWM*/SERVO

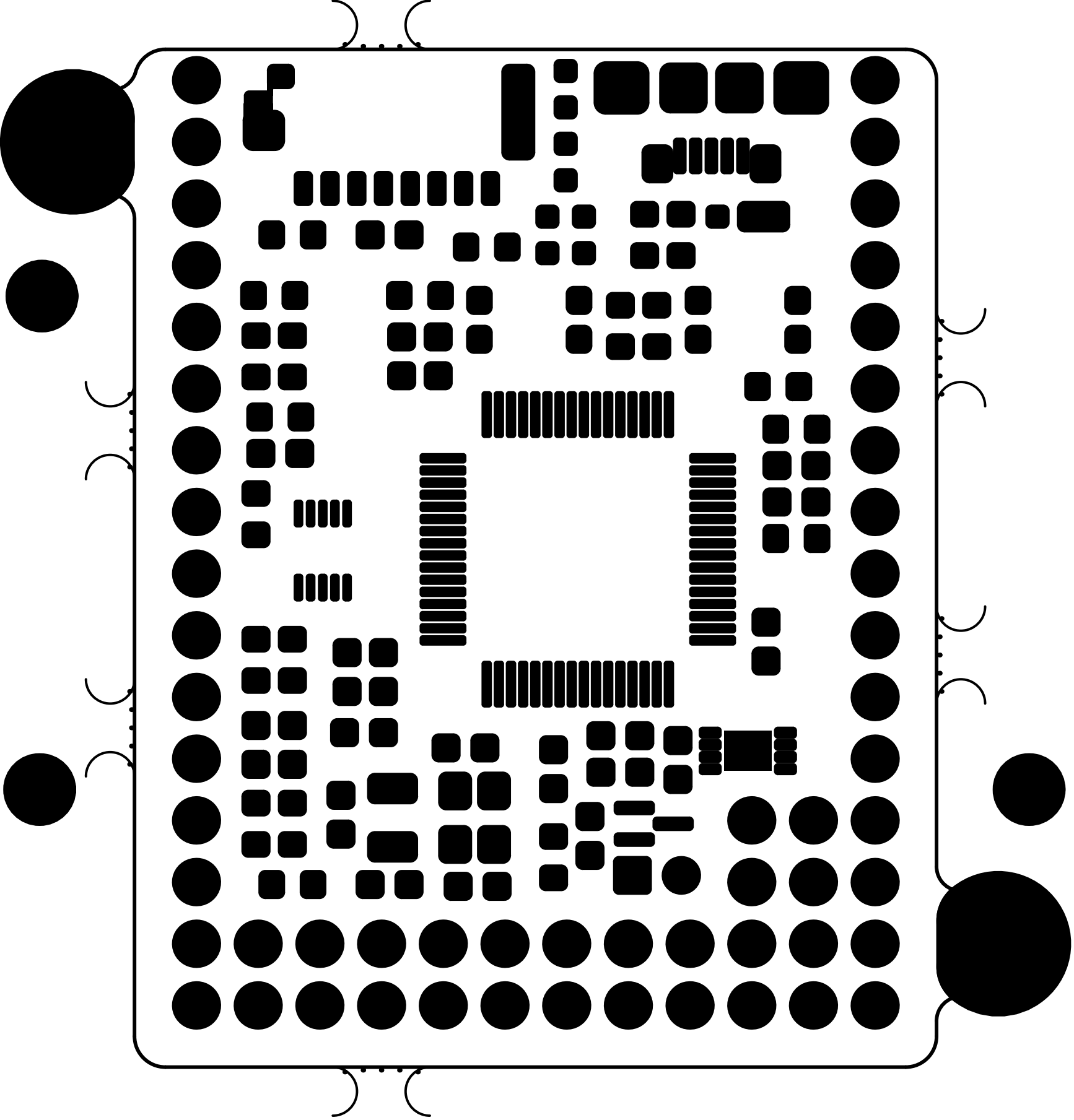
Internal use ports

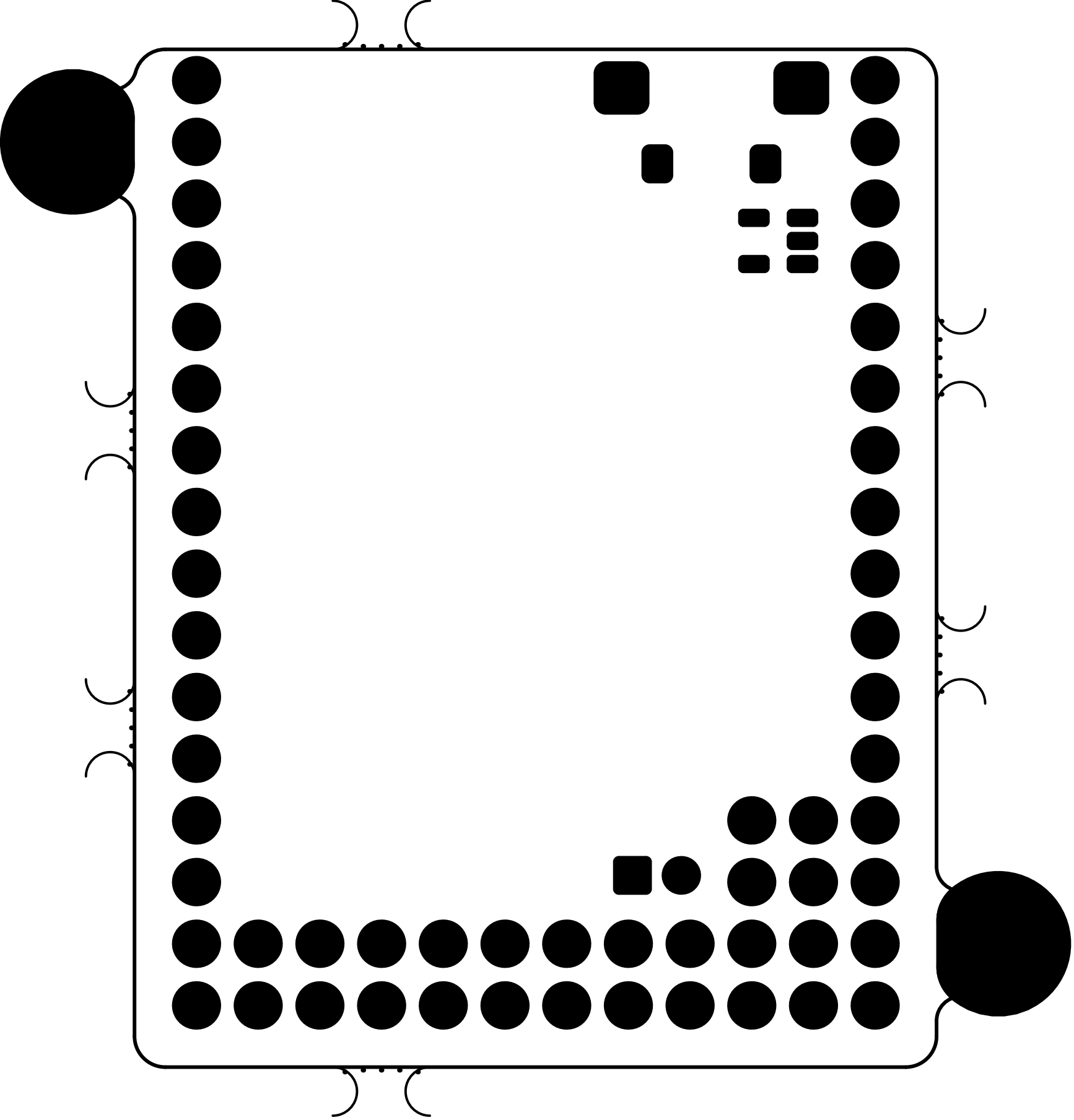
PA9/OTG-VBUS
not supported/OTG-ID
PA11/USB-DM
PA12/USB-DP
PC8/SDIO_D0
PC9/SDIO_D1
PC10/SDIO_D2
PC11/SDIO_D3
PC12/SDIO_CK
PA10/SDIO_SW
PD2/SDIO_CMD
PB6/SCL/MMA-SCL (shared with pin)
PB7/SDA/MMA-SDA (shared with pin)
PB2/BOOT1//MMA_INT
PB5/MMA_AVDD
PB4/BLUE_LED/JTAG-TRST (shared with pin)
PA13/RED_LED/JTAG-TMS/SWDIO (shared with pin)
PA14/GRN_LED/TCK/SWCLK (shared with pin)
PA15/YEL_LED/TDI (shared with pin)
PB3/USR_SW/TDO/TRACESWO (shared with pin)

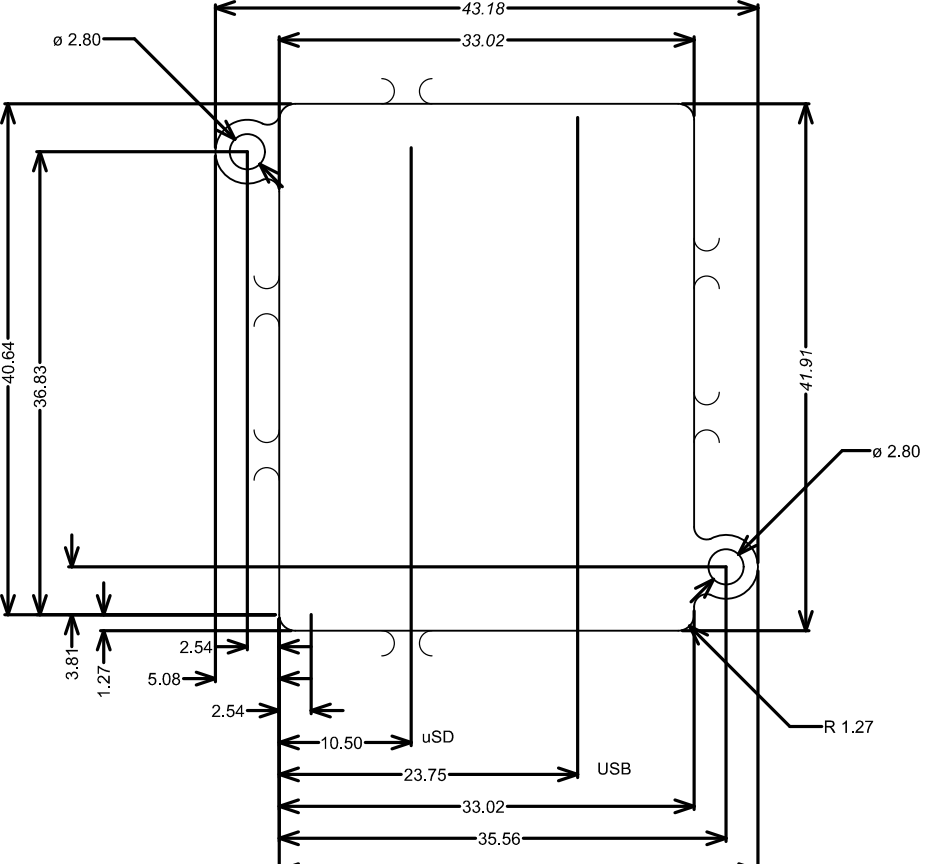


DESIGN RULES.
Board profile and connector grid. 1.27mm (50mil).
Component placement grid. 0.25mm
Routing grid. 0.05mm
Minimum track and spacing. 0.15mm (6mil).
Minimum via size. Hole 0.25mm, pad 0.6mm.

PCB spec.
2 layer 1.6mm FR4. Green mask. White legend - 2 sides. Gold finish pb free. Electrical te



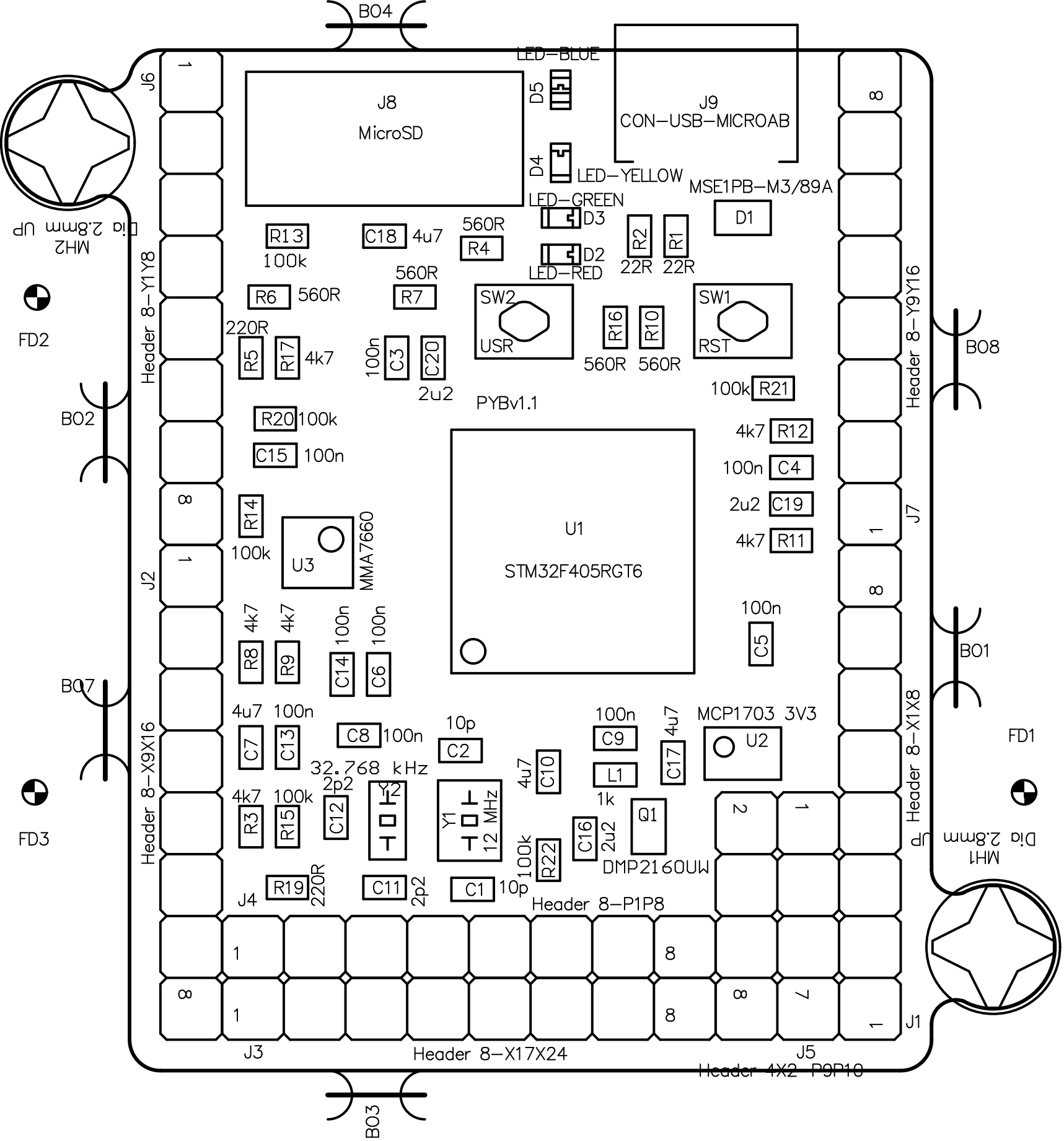


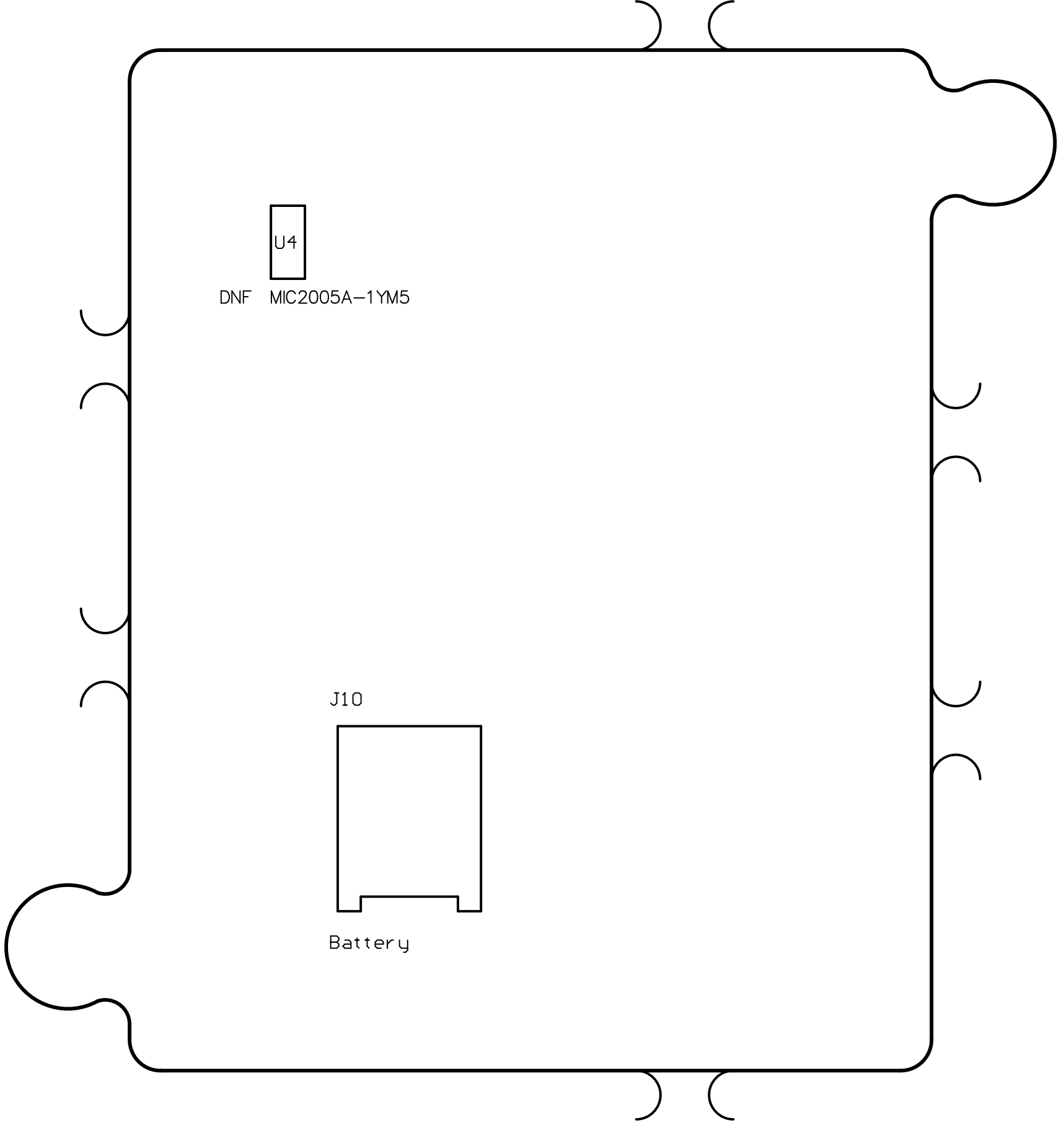


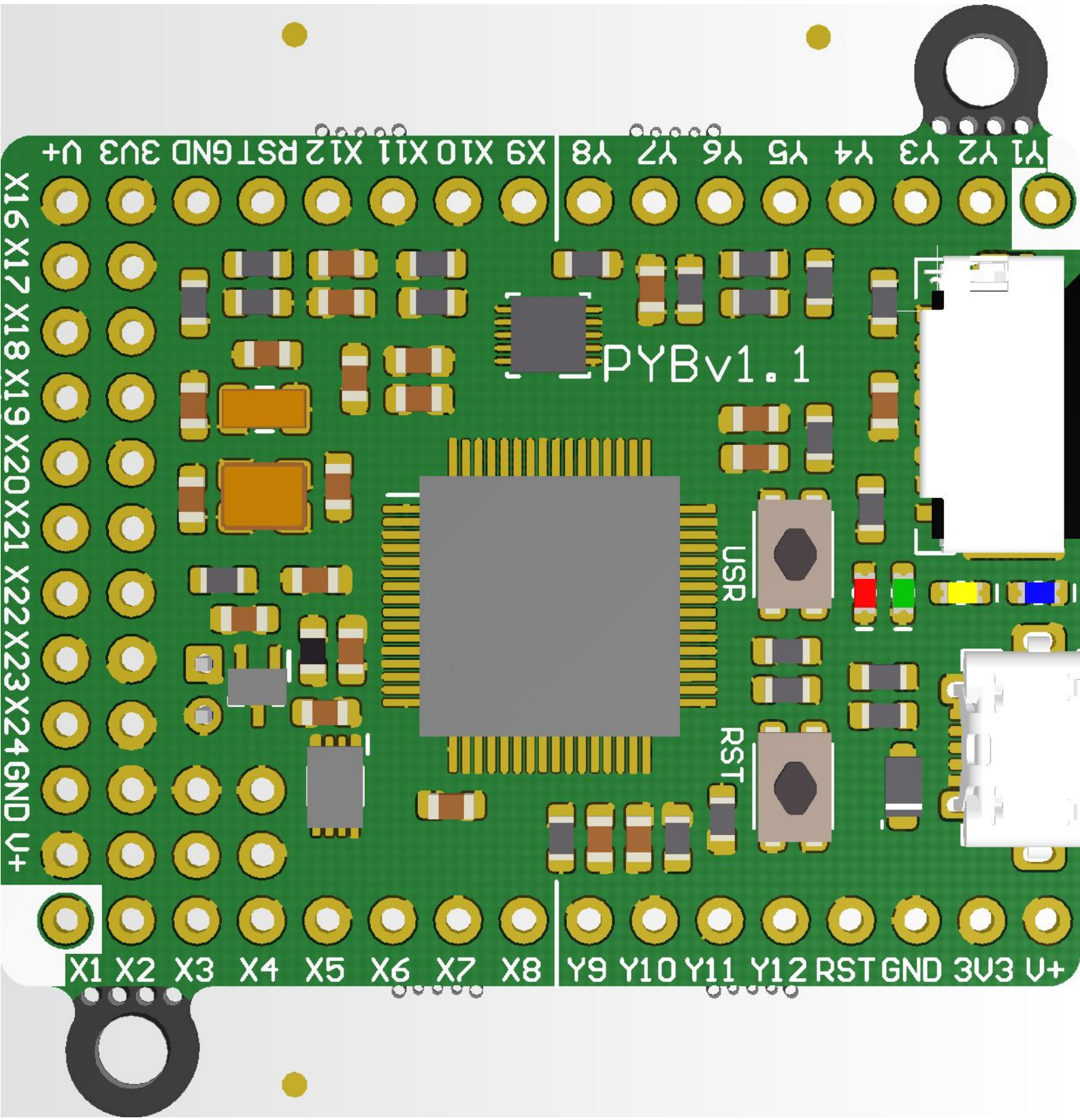
The board origin (0,0) is the bottom left corner of a half size skin compatible with X or Y position.

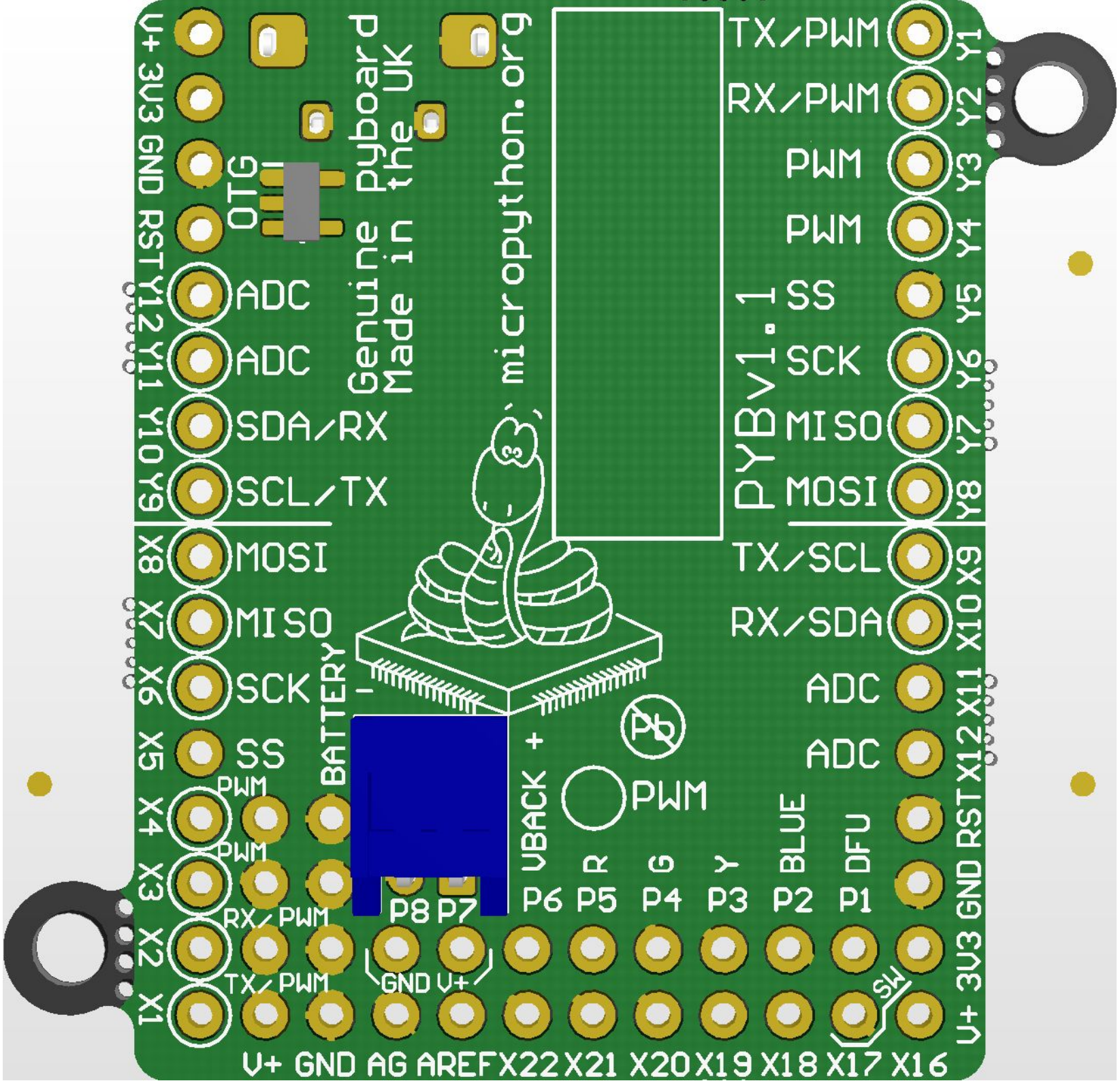
The pyboard extends 1.27mm (50mil) below the origin to allow for labels on the bottom connector.

Dimensions in italics are for reference only.


BO4
LED-BLUE
J8
MicroSD
D5
J9
CON-USB-MICROAB
D4
LED-YELLOW
MSE1PB-M3/89A
LED-GREEN
D3
D1
R13
100k
C18
4u7
560R
R4
D2
LED-RED
R2
22R
R1
22R
560R
R7
R6
560R
SW2
USR
SW1
RST
220R
R5
R17
4k7
100n
C3
C20
2u2
R16
560R
R10
560R
100k
R21
PYBv1.1
R20
100k
C15
100n
4k7
R12
100n
C4
2u2
C19
4k7
R11
U1
STM32F405RGT6
R14
100k
U3
MMA7660
4k7
R8
4k7
R9
100n
C14
100n
C6
100n
C5
4u7
C7
100n
C13
C8
100n
10p
C2
32.768 kHz
Y2
2p2
C12
4k7
R3
100k
R15
Y1
12 MHz
4u7
C10
100n
C9
4u7
C17
MCP1703 3V3
U2
L1
1k
Q1
DMP2160UW
C16
2u2
100k
R22
R19
220R
C11
2p2
C1
10p
J4
Header 8-P1P8
J6
J2
J7
J8
J3
Header 8-X17X24
J5
Header 4X2-P9P10
J1
Header 8-Y1Y8
Header 8-Y9Y16
Header 8-X9X16
Header 8-X1X8
MH2
Dia 2.8mm UP
MH1
Dia 2.8mm UP
BO2
BO8
BO7
BO1
BO3
FD2
FD1
FD3


U4
DNF MIC2005A-1YM5
J10
Battery


X1 X2 X3 X4 X5 X6 X7 X8
Y9 Y10 Y11 Y12 RST GND 3V3 V+
X16 X17 X18 X19 X20 X21 X22 X23 X24 GND V+
V+ 3V3 GND RST X12 X11 X10 X9
Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8
PYBv1.1
USR
RST


V+ 3V3 GND RST Y12 Y11 Y10 Y9
OTG
Genuine pyboard
Made in the UK
micropython.org
ADC
ADC
SDA/RX
SCL/TX
MOSI
MISO
SCK
SS
PWM
PWM
RX/PWM
TX/PWM
BATTERY
-
+
VBACK
P8 P7
P6 P5 P4 P3 P2 P1
R G Y BLUE DFU
PWM
PYBv1.1
TX/PWM
RX/PWM
PWM
PWM
SS
SCK
MISO
MOSI
TX/SCL
RX/SDA
ADC
ADC
GND RST X12 X11 X10 X9 Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8
V+ 3V3 GND RST X12 X11 X10 X9 X8 X7 X6 X5 X4 X3 X2 X1
SW
V+ GND AG AREF X22 X21 X20 X19 X18 X17 X16