

Revision 1.4
ECE 3612

**EXT3_20P05
RIGHT ANGLE
FEMALE HEADER**

April 5 2018

EXT4

EXT1
EXT1 RIGHT ANGLE MALE HEADER

EXT4 RIGHT ANGLE MALE HEADER

PORTA_SW1

ZIF

LED0
LED1
LED2
LED3
LED4
LED5
LED6
LED7

SERVO

UART

PING

TIP115

UIN2003A

DC_MOTOR

4N28

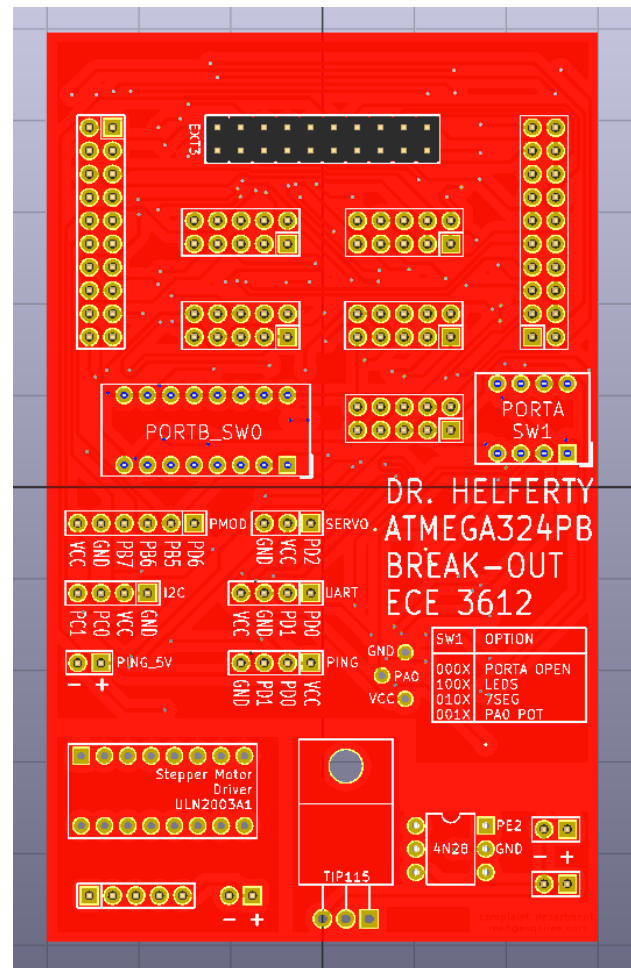
D1

M_POWER

Stepper_Power

STEPPER

5-12V



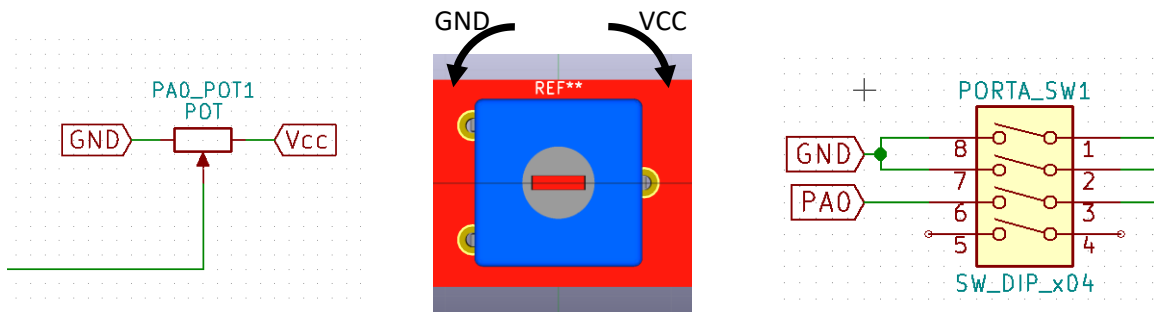
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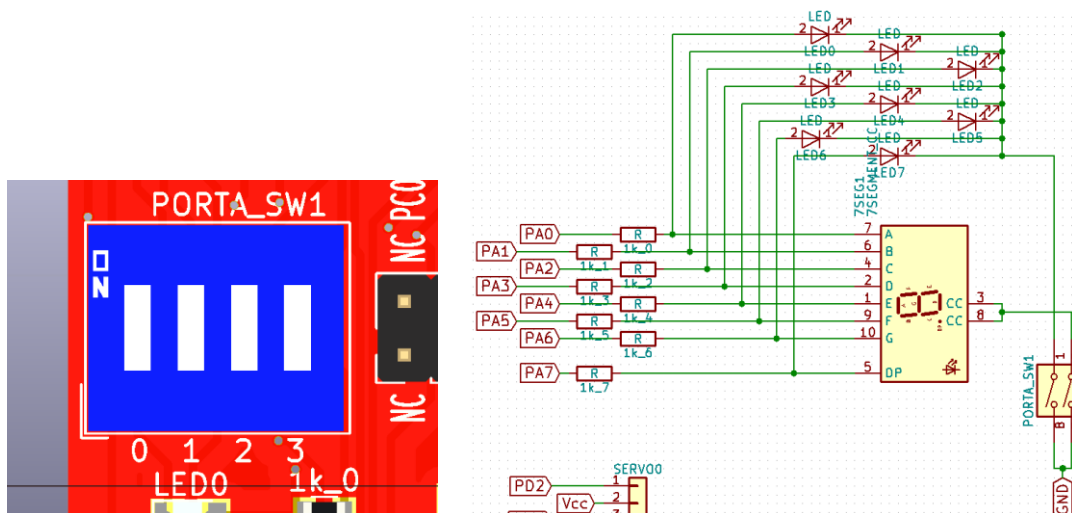
PORT A

PORT A has three purposes:

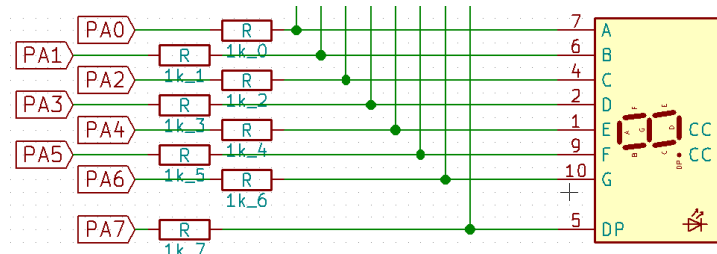
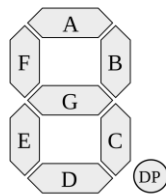
1. **Analog Input (ADC0-7).** PA0(ADC0) is connected to the potentiometer through PORTA_SW1. To enable the potentiometer, PORTA_SW1 needs to be set properly. The first two switches need to be turned ON (labeled 0&1 on the silkscreen), this leaves PORTA floating. If these are enabled, the analog input will be pulled to ground. Next to use the potentiometer, enable switch 2.



2. **LED Output.** LED0-LED7 are connected to PA0-PA7 through 1k Ohm resistors. To complete the circuit, giving the LEDs a path to ground, PORTA_SW1 0 must be enabled. If LED0 does not turn ON/OFF properly, turn off PORTA_SW1 2.



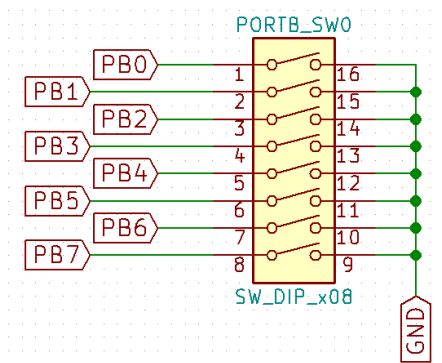
3. **Seven Segment Display**. The LEDs inside this KCS02 package use the same current limiting 1k Ohm resistors as the 8 individual LEDs. This is a common cathode (CC) device. To enable the SSD, set PORTA_SW1 1 to ON. Disable PORTA_SW1 2 if segment A is not working properly.



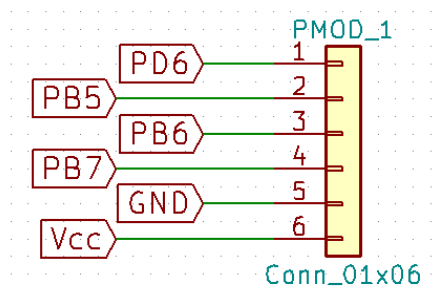
PORT B

PORT B has two purposes:

1. **DIP Switch**. This switch connects PB0-PB7 to ground when enabled. Remember to use the internal pull up resistors when using this input.

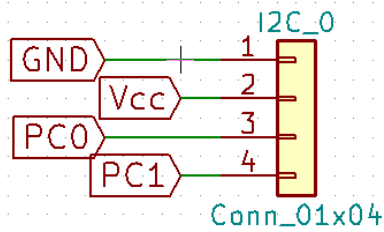


2. **PMOD**. The ATmega324PB uses PB5-PB7 for the SPI communications. When using this header, disable the corresponding switches on PORT B to leave them floating.



PORT C

1. **I2C Interface.** PC0 and PC1 are used for hardware I2C communications in the ATmega 324PB. VCC is 3.3V.

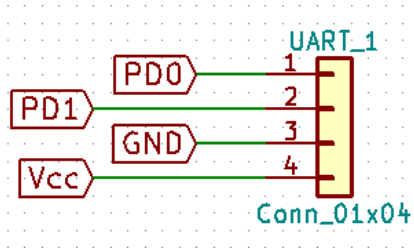


2. PC2-5 are used for JTAG communications and can not be accessed by default.

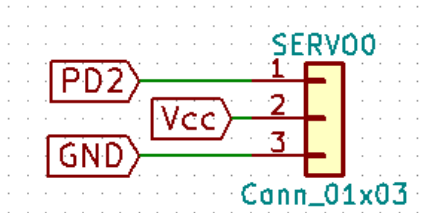
PORT D

Port D has four purposes:

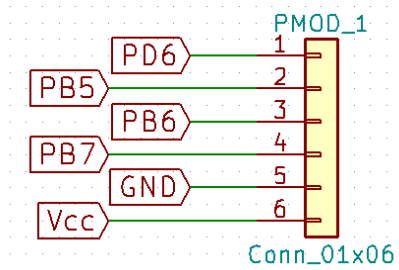
1. **UART Interface.** PD0 and PD1 are used for hardware UART communications in the ATmega 324PB. VCC is 3.3V.



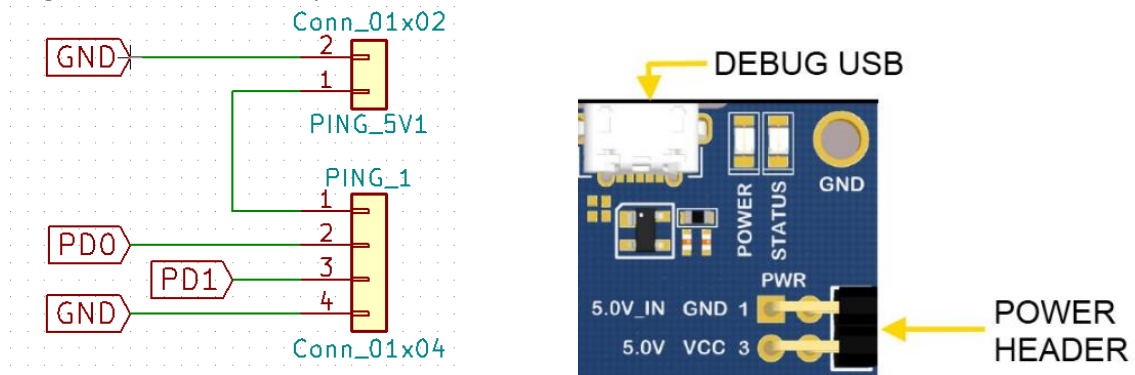
2. **Servo Motor.** PD2 is used to control the servo through PWM. VCC is 3.3V.



3. **PMOD.** PD6 is used as the slave select line for the hardware PMOD communications in the ATmega 324PB.



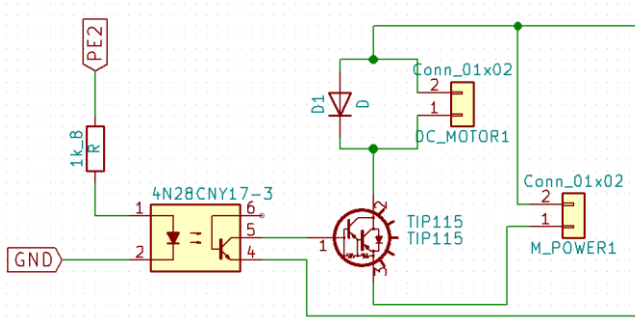
4. **PING Sensor.** The ping sensor requires 5V power. A female to female jumper wire can be used to get 5V from the USB input to the XPLAINED board.



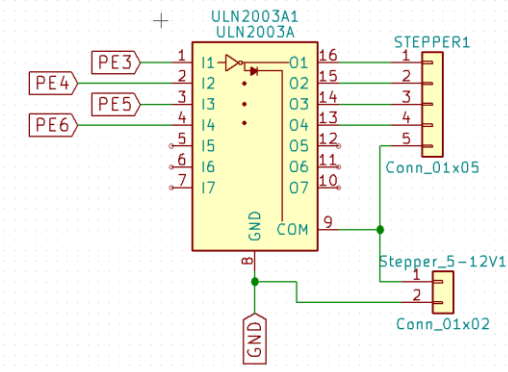
PORT E

Port E has two purposes:

1. **DC Motor.** PE2 is connected to a 4N28 opto-isolator. This IC prevents noise and feedback from being introduced. A PNP Darlington transistor is used to amplify the signal. An external power source is needed.



2. **Stepper Motor.** PE3-6 are connected to the ULN2003A IC. This IC amplifies the signals. An External power source is needed. 5V is the minimum and 12V is the maximum.



A stylized illustration of a complex circuit board. The board is filled with intricate patterns of red and yellow lines representing traces and components. Numerous small yellow circles, likely representing solder points or vias, are scattered across the board. A prominent yellow circle is located in the lower-left quadrant. The overall design is dense and technical, set against a solid black background.

The diagram illustrates a circuit board layout for a motor control application. The board is populated with various components, including a microcontroller (ATMEGA324PB), a motor driver (U1:55003A1), a stepper motor (28666r Motor), and a switch (PORTA_2SW). The board is labeled with 'ECE 3615' and 'ATMEGA324PB'. The diagram includes a detailed pinout for the 'PORTA_2SW' connector, showing pins 1 through 16 and their corresponding functions. The board is also labeled with 'PORTA_2SW' and 'PORTA_2SW'.

PORTA_2SW Pinout:

| SWT | OPTION |
|------|------------|
| 001X | P00 POL |
| 010X | 12EG |
| 100X | FE0S |
| 000X | PORTA OPEN |

Other Components and Labels:

- U1:55003A1**: Motor driver IC.
- 28666r Motor**: Stepper motor.
- PORTA_2SW**: Switch component.
- ATMEGA324PB**: Microcontroller.
- ECE 3615**: Board identifier.
- PORTA_2SW**: Connector label.
- PORTA_2SW**: Connector label.

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EXT4

EXT1

EXT1 RIGHT ANGLE MALE HEADER

PORT_A1

PORT_B1

PORT_C1

PORT_D1

PORT_E1

PORT_F1

PORT_G1

PORT_H1

PORT_I1

PORT_J1

PORT_K1

PORT_L1

PORT_M1

PORT_N1

PORT_O1

PORT_P1

PORT_Q1

PORT_R1

PORT_S1

PORT_T1

PORT_U1

PORT_V1

PORT_W1

PORT_X1

PORT_Y1

PORT_Z1

PORT_AA1

PORT_AB1

PORT_AC1

PORT_AD1

PORT_AE1

PORT_AF1

PORT_AG1

PORT_AH1

PORT_AI1

PORT_AJ1

PORT_AK1

PORT_AL1

PORT_AM1

PORT_AN1

PORT_AO1

PORT_AP1

PORT_AQ1

PORT_AR1

PORT_AS1

PORT_AT1

PORT_AU1

PORT_AV1

PORT_AW1

PORT_AX1

PORT_AY1

PORT_AZ1

PORT_BA1

PORT_BB1

PORT_BC1

PORT_BD1

PORT_BE1

PORT_BF1

PORT_BG1

PORT_BH1

PORT_BI1

PORT_BJ1

PORT_BK1

PORT_BL1

PORT_BM1

PORT_BN1

PORT_BO1

PORT_BP1

PORT_BQ1

PORT_BR1

PORT_BS1

PORT_BT1

PORT_BU1

PORT_BV1

PORT_BW1

PORT_BX1

PORT_BY1

PORT_BZ1

PORT_CA1

PORT_CB1

PORT_CC1

PORT_CD1

PORT_CE1

PORT_CF1

PORT.CG1

PORT_CH1

PORT_CI1

PORT_CJ1

PORT_CK1

PORT_CL1

PORT_CM1

PORT_CN1

PORT_CO1

PORT_CP1

PORT_CQ1

PORT_CR1

PORT_CS1

PORT_CT1

PORT_CU1

PORT_CV1

PORT_CW1

PORT_CX1

PORT_CY1

PORT_CZ1

PORT_DA1

PORT_DB1

PORT_DC1

PORT_DD1

PORT_DE1

PORT_DF1

PORT.DG1

PORT_DH1

PORT_DI1

PORT_DJ1

PORT_DK1

PORT_DL1

PORT_DM1

PORT_DN1

PORT_DO1

PORT_DP1

PORT_DQ1

PORT_DR1

PORT_DS1

PORT_DT1

PORT_DU1

PORT_DV1

PORT_DW1

PORT_DX1

PORT_DY1

PORT_DZ1

PORT_EA1

PORT_EB1

PORT_EC1

PORT_ED1

PORT_EF1

PORT. EG1

PORT_EH1

PORT_EI1

PORT_EJ1

PORT_EK1

PORT_EL1

PORT_EM1

PORT_EN1

PORT_EO1

PORT_EP1

PORT_EQ1

PORT_ER1

PORT_ES1

PORT_ET1

PORT_EU1

PORT_EV1

PORT_EW1

PORT_EX1

PORT_EY1

PORT_EZ1

PORT_FA1

PORT_FB1

PORT_FC1

PORT_FD1

PORT_FE1

PORT_FF1

PORT.FG1

PORT_FH1

PORT_FI1

PORT_FJ1

PORT_FK1

PORT_FL1

PORT_FM1

PORT_FN1

PORT_FO1

PORT_FP1

PORT_FQ1

PORT_FR1

PORT_FS1

PORT_FT1

PORT_FU1

PORT_FV1

PORT_FW1

PORT_FX1

PORT_FY1

PORT_FZ1

PORT_GA1

PORT_GB1

PORT_GC1

PORT_GD1

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PORT_GM1

PORT_GN1

PORT_GO1

PORT_GP1

PORT_GQ1

PORT_GR1

PORT_GS1

PORT_GT1

PORT_GU1

PORT_GV1

PORT_GW1

PORT_GX1

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PORT_GZ1

PORT_HA1

PORT_HB1

PORT_HC1

PORT_HD1

PORT_HE1

PORT_HF1

PORT.HG1

PORT_HH1

PORT_HI1

PORT_HJ1

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PORT_HO1

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PORT_HR1

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PORT_HT1

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PORT_HV1

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PORT_HX1

PORT_HY1

PORT_HZ1

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PORT_IE1

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PORT_IH1

PORT_II1

PORT_IJ1

PORT_IK1

PORT_IL1

PORT_IM1

PORT_IN1

PORT_IO1

PORT_IP1

PORT_IQ1

PORT_IR1

PORT_IS1

PORT_IT1

PORT_IU1

PORT_IV1

PORT_IW1

PORT_IX1

PORT_IY1

PORT_IZ1

PORT_JA1

PORT_JB1

PORT_JC1

PORT_JD1

PORT_JE1

PORT_JF1

PORT.JG1

PORT_JH1

PORT_JI1

PORT_JJ1

PORT_JK1

PORT_JL1

PORT_JM1

PORT_JN1

PORT_JO1

PORT_JP1

PORT_JQ1

PORT_JR1

PORT_JS1

PORT_JT1

PORT_JU1

PORT_JV1

PORT_JW1

PORT_JX1

PORT_JY1

PORT_JZ1

PORT_KA1

PORT_KB1

PORT_KC1

PORT_KD1

PORT_KE1

PORT_KF1

PORT.KG1

PORT_KH1

PORT_KI1

PORT_KJ1

PORT_KK1

PORT_KL1

PORT_KM1

PORT_KN1

PORT_KO1

PORT_KP1

PORT_KQ1

PORT_KR1

PORT_KS1

PORT_KT1

PORT_KU1

PORT_KV1

PORT_KW1

PORT_KX1

PORT_KY1

PORT_KZ1

PORT_LA1

PORT_LB1

PORT_LC1

PORT_LD1

PORT_LE1

PORT_LF1

PORT.LG1

PORT_LH1

PORT_LI1

PORT_LJ1

PORT_LK1

PORT_LL1

PORT_LM1

PORT_LN1

PORT_LO1

PORT_LP1

PORT_LQ1

PORT_LR1

PORT_LS1

PORT_LT1

PORT_LU1

PORT_LV1

PORT_LW1

PORT_LX1

PORT_LY1

PORT_LZ1

PORT_MA1

PORT_MB1

PORT_MC1

PORT_MD1

PORT_ME1

PORT_MF1

PORT.MG1

PORT_MH1

PORT_MI1

PORT_MJ1

PORT_MK1

PORT_ML1

PORT_MM1

PORT_MN1

PORT_MO1

PORT_MP1

PORT_MQ1

PORT_MR1

PORT_MS1

PORT_MT1

PORT_MU1

PORT_MV1

PORT_MW1

PORT_MX1

PORT_MY1

PORT_MZ1

PORT_NA1

PORT_NB1

PORT_NC1

PORT_ND1

PORT_NE1

PORT_NF1

PORT.NG1

PORT_NH1

PORT_NI1

PORT_NJ1

PORT_NK1

PORT_NL1

PORT_NM1

PORT>NN1

PORT_NO1

PORT_NP1

PORT_NQ1

PORT_NR1

PORT_NS1

PORT_NT1

PORT_NU1

PORT_NV1

PORT_NW1

PORT_NX1

PORT_NY1

PORT_NZ1

PORT_OA1

PORT_OB1

PORT_OC1

PORT_OD1

PORT_OE1

PORT_OF1

PORT. OG1

PORT_OH1

PORT_OI1

PORT_OJ1

PORT_OK1

PORT_OL1

PORT_OM1

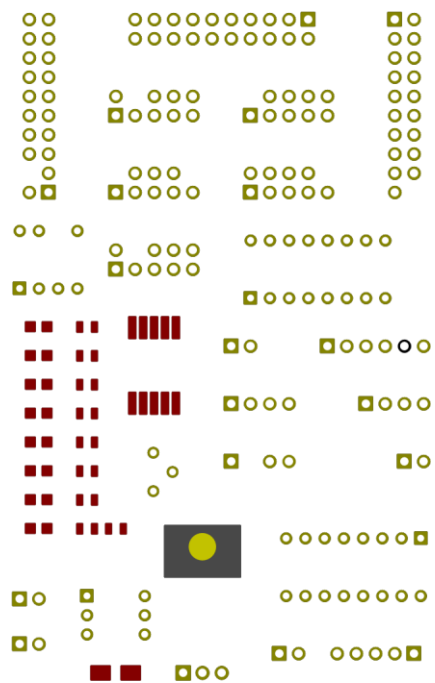
PORT_ON1

PORT_OO1

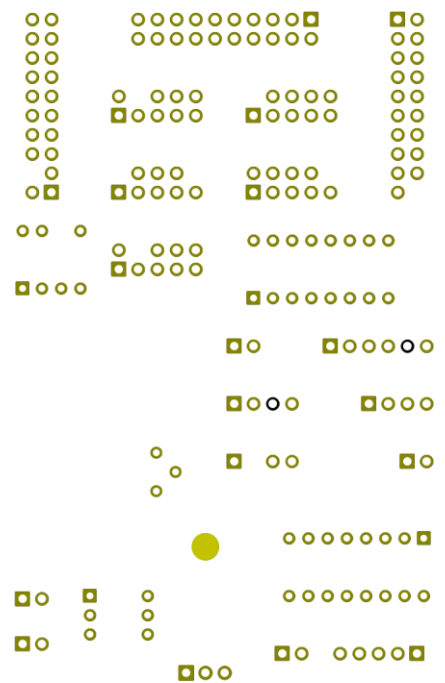
PORT_OP1

PORT_OQ

Front Silkscreen Layer



Front Solder Mask Layer



Bottom Solder Mask Layer

Designed using KiCad, a free and open source EDA.

