POWER

BATTERY

3.3–5.0V

J1

BATTERY

GND

SWITCH

PWR_FLAG

PWR_FLAG

+BATT

5VUSB

ON

OFF

M1

M2

SW1

SK12D07L4B

RPP

Q_PMOS_GSD

P-CHNL

Rds(on)0.06

Q21

D

G

S

REVERSE

POLARITY

PROTECTION

R21

10K

GND

+V SWITCHED

+VSW

+VSW

JP8

SolderJumper_2_Open

C11

220uF

C12

220uF

GND

GND

ALT. 5V FOR MOTOR

+MOT

Conn_01x02_MOTOR_POWER

J6

SERIAL 5VUSB

5VUSB

* PWR_FLAG is a KiCAD formality.

MICROCONTROLLER

+VSW

R7

10K

U1

ATmega328PB–A

		UNO	SPI	U.I.	R/C	S.P.	ISP	I2C	MOTOR
4	VCC								
18	AVCC								
20	AREF								
12	(ICP1/CLKO/PTCXY)PB0	8			PWM_IN				
13	(OC1A/PTCXY)PB1	9 PWM							GATE_AL
14	(SS0/OC1B/PTCXY)PB2	10 PWM							GATE_BL
15	(MOSI0/TXD1/OC2A/PTCXY)PB3	11 PWM	SPI0_MOSI				ISP_TXD1		GATE_CL
16	(MISO0/RXD1/PTCXY)PB4	12	SPI0_MISO				ISP_RXD1		HALL_U
17	(PTCXY/XCK1/SCK0)PB5	13 LED	SPI0_SCK		LED_RGB		ISP_XCK1		
7	PB6(XTAL1/OSC1)	OSC1							
8	PB7(XTAL2/OSC2)	OSC2							
23	(ADC0/PTCY/MISO1)PC0	14 ADC0							FEEDBACK_C
24	(ADC1/PTCY/SCK1)PC1	15 ADC1							FEEDBACK_B
25	(ADC2/PTCY)PC2	16 ADC2							FEEDBACK_A
26	(ADC3/PTCY)PC3	17 ADC3	SPI_CS						HALL_V
27	(ADC4/PTCY/SDA0)PC4	18 ADC4						I2C_SDA0	
28	(ADC5/PTCY/SCL0)PC5	19 ADC5						I2C_SCL0	
29	RESET/PC6	RESET				RESET	RESET		
30	(PTCXY/OC3A/RXD0)PD0	0 PWM							
31	(PTCXY/OC4A/TXD0)PD1	1 PWM		TACH_OUT		SPH_RXD0			
32	(PTCXY/INT0/OC3B/OC4B)PD2	2 PWM				SPH_TXD0			
1	(OC2B/INT1/PTCXY)PD3	3 PWM							GATE_CH
2	(XCK0/T0/PTCXY)PD4	4	SPI_DC						GATE_BH
9	(OC0B/T1/PTCXY)PD5	5 PWM							GATE_AH
10	(OC0A/PTCXY/AIN0)PD6	6 PWM							GATE_AH_ALT
11	(PTCXY/AIN1)PD7	7	SPI_RST						FEEDBACK_COM
3	(SDA1/ICP4/ACO/PTCXY)PE0	22		TOUCH_S					HALL_W
6	(SCL1/T4/PTCXY)PE1	23		TOUCH_+					
19	(ADC6/PTCY/ICP3/SS1)PE2	20 ADC6		TOUCH_–					
22	(ADC7/PTCY/T3/MOSI1)PE3	21 ADC7		TOUCH_M					

GND

GND

C1 220uF

C2 10uF

C3 0.1uF

C4 0.1uF

Y1

20MHz 15pF Resonator

GND

TP_M H1

TP_– H2

TP_+ H3

TP_S H4

SERIAL PROGRAM

J2

Conn_01x06_SERIAL_PROG_HEADER

RESET

C5

0.1uF

DTR/RTS

SPH_TXD0

SPH_RXD0

5VUSB

GND

ISP PROGRAM

J5

Conn_02x03_Odd_Even_ISP

ISP_RXD1

ISP_XCK1

RESET

5VUSB

ISP_TXD1

KEY AT PIN 3

GND

TOUCH BUTTONS

I2C BUS INTERFACE

+VSW

R30

1K2

R31

1K2

68 R32

68 R33

I2C_SCL0

I2C_SDA0

I2C_SCL0_PU

I2C_SDA0_PU

SAO: SIMPLE ADD–ONS

https://hackaday.io/project/175182–simple–add–ons–sao

using Sullins SFH11–NBPC–D03–ST–BK female header

https://www.digikey.com/product–detail/en/sullins–connector–solutions/SFH11–NBPC–D03–ST–BK/S9717–ND/4558818

OPTIONAL I2C STUFF:

SAO OLED or

Generic 0.96" (128x64) or 1.5" (128x128)

I2C 4–pins, often ADDRESS: 0x3C (60 decimal)

Alternate is 0x3D, not 0x7A or 0x78 (wrong 8–bit)!

OLED 0x3C (60)

AND!XOR IO Exp. MCP23017 0x20 (32)

AND!XOR EEPROM AT24C32r 0x50 (80)

NFC CLICK PN7120 0x50–53

All 7–bit addresses should be greater than 0x07 and less than 0x78 (120).

+VSW

I2C_SDA0_PU

HALL_V

X1

SAO_Header

I2C_SCL0_PU

HALL_W

{I2C BUS}

GND

R/C IN

J4

Conn_01x04

TACH_OUT

PWM_IN

+VSW

GND

STATUS LED

D21 SK6812

+VSW

VDD

DOUT

DIN

GND

LED_RGB

GND

QWIIC I2C

X2

QWIIC

MP

MP

I2C_SCL0_PU

I2C_SDA0_PU

+VSW

GND

WINDING SELECT

DELTA

SolderJumper_3_Open

JP1

SolderJumper_3_Open

JP3

SolderJumper_3_Open

JP2

WYE

SolderJumper_2_Open

JP5

SolderJumper_3_Open

JP4

JP7

SolderJumper_2_Open

JP6

SolderJumper_2_Open

INTERNAL MOTOR

PHASE_A+

PHASE_A–

PHASE_B+

PHASE_B–

PHASE_C+

PHASE_C–

J11

J12

J13

J14

J15

J16

J17

J18

J19

J20

J21

J22

A1+

A1–

A2+

A2–

B1+

B1–

B2+

B2–

C1+

C1–

C2+

C2–

A1–A2

B1–B2

C1–C2

EXTERNAL HALL SENSORS

J9

Conn_01x04

+VSW

HALL_U

HALL_V

HALL_W

GND

MOTOR DRIVER

+MOT

GATE_AH

GATE_BH

GATE_CH

GATE_AL

GATE_BL

GATE_CL

R8 470

R9 470

R10 470

R11 470

R12 470

R13 470

AH

BH

CH

AL

BL

CL

R1 1K

R2 1K

R3 1K

R4 1K

R5 1K

R6 1K

Q_PMOS_GSD Q1

Q_PMOS_GSD Q3

Q_PMOS_GSD Q5

Q_NMOS_GSD Q2

Q_NMOS_GSD Q4

Q_NMOS_GSD Q6

TP1 AH

TP2 AL

TP3 BH

TP4 BL

TP5 CH

TP6 CL

TP7 A

TP8 B

TP9 C

PHASE_A

PHASE_B

PHASE_C

GND

EXTERNAL MOTOR

Conn_01x03

J8

PHASE_A

PHASE_B

PHASE_C

FEEDBACK

FEEDBACK_A

FEEDBACK_B

FEEDBACK_C

1K R41

1K R42

1K R43

FEEDBACK_COM

C7 0.1uF

GND

SILKSCREEN FRONT

SILKSCREEN BACK

All non–polarized capacitors are X7R or X5R ceramic unless otherwise noted.

Concept and design by Andy Geppert ● www.MachineIdeas.com

Sheet: /

File: BLDC_BIZ_CARD.kicad_sch

Title: BLDC_BIZ_CARD

Size: B	Date: 2024–06–20	**Rev: 0.1**
KiCad E.D.A. 8.0.2–1		Id: 1/1