Resonator 16 MHz

16MHz
X2 3 XTAL2
GND 2
X1 1 XTAL1
U10
GND

ICSP

P3
SD_V_MISO1 SD_U_SCK 3 RESET 5
ICSP
2 4 6
SD_W_MOSI GND

IC1
ATMEGA328PB-A
4 VCC 18 AVCC
+5V +5V
0.1uF C34
GND

NC 20 AREF

	(CLKO/ICP1/PTCXY)PB0	12 HALL_U
	(OC1A/PTCXY)PB1	13 HALL_V
	(OC1B/SS0/PTCXY)PB2	14 HALL_W
	(MOSI0/TXD1/OC2A/PTCXY)PB3	15 SD_W_MOSI
	(MISO0/RXD1/PTCXY)PB4	16 SD_V_MISO
	(XCK0/SCK0/PTCXY)PB5	17 SD_U_SCK
	(XTAL1/TOSC1)PB6	7 XTAL1
	(XTAL2/TOSC2)PB7	8 XTAL2
	(MISO1/ADC0/PTCY)PC0	23 BEMF_U
	(SCK1/ADC1/PTCY)PC1	24 BEMF_V
	(ADC2/PTCY)PC2	25 BEMF_W
	(ADC3/PTCY)PC3	26 THROTTLE
	(SDA0/ADC4/PTCY)PC4	27 MOTOR_TEMP
	(SCL0/ADC5/PTCY)PC5	28 ASSIST_SW
	(RESET)PC6	29 RESET
	(RXD0/OC3A/PTCXY)PD0	30 RX-I
	(TXD0/OC4A/PTCXY)PD1	31 TX-O
	(OC3B/OC4B/INT0/PTCXY)PD2	32 IN_U_PWM
	(OC2B/INT1/PTCXY)PD3	1 IN_V_PWM
	(XCK0/T0/PTCXY)PD4	2 LED_FET_5V
	(OC0B/T1/PTCXY)PD5	9 IN_W_PWM
	(OC0A/AIN0/PTCXY)PD6	10 FET_12V
	(AIN1/PTCXY)PD7	11 BRAKE
PAS 3	PE0(PTCXY/SDA1/ICP4/ACO)	
SPEED 6	PE1(PTCXY/SCL1/T4)	
VOLTAGE 19	PE2(PTCXY/ADC6/ICP3/SS1)	
CURRENT 22	PE3(PTCY/ADC7/T3/MOSI1)	

GND GND 5 21 GND

R40 10K +5V
C33 0.1uF
R44 4k
D4 LED

MAX BAT VOLT
- voltage sense
- on/off mosfet + Rs
- DC/DC in max
- Caps max voltage
- BEMF
- MOSFET max voltage

Bluetooth

U8
RN4020
+3.3V +3.3V
R25 10k
TXD 5
RXD 6
WAKE_HW 7
8

1	GND	GND 24
2	AIO2	VDD 23
3	AIO1	N/C 22
4	AIO0	N/C 21
5	UART_TX	N/C 20
6	UART_RX	PIO7 19
7	WAKE_SW	RTS 18
8	CMD	SPI 17

GND PIO1 PIO2 PIO3 PIO4 CTS WAKE_HW GND
9 10 11 12 13 14 15 16
C32 4.7uF
WAKE_HW

+3.3V +5V
R23 10k TXD
Q7 BSS138
R24 10k RX-I
TX-O
R14 680
RXD
R15 1k
P17 TXD RXD pinhead
+3.3V P18 pinhead
P2 RX-I TX-O pinhead

Connectors

P5 1 MOTOR_TEMP

Assist
P1 pinhead
ASSIST_SW 1
2 10k R46 47k R48
3
4 10k R45

BRAKE R22 1k
C29 0.1uF
P7 pinhead

12V permanent
P9 pinhead

SPEED R28 100 SPEED_IN
R35 1k
C23 0.1uF
K2 3s 1st-xh

PAS R34 100
R39 1k
C22 0.1uF
K1 3s 1st-xh

THROTTLE
K3 3s 1st-xh
47k R49
Pull to ground when nothing connected

P8 5s 1st-xh
SPEED_IN 2
HALL_U_IN 3
HALL_V_IN 4
HALL_W_IN 5
6

P4 pinhead
FET_12V
Q9 BSS138
10k R43

Sensors / Actors

Voltage, Current Sensing

P10 V_BATT
R29 147k VOLTAGE
R30 10k
Voltage Sense

Q11 BAT_MINUS
P11
U5 ACS712
IP+ IP+ IP- IP- Vcc Vout Filter Gnd
1 2 3 4 8 7 6 5
Current Sense
CURRENT
C25 0.1uF
P16

POWER – 12V – 5V – 3V3

Power

LED pinhead P12
R33 10k
LED D7

DC/DC converter 60V->12V

U4 LMR16006Y
CB GND FB SW VIN SHDN_
1 2 3 6 5 4
C20
+BATT +12V
L1
R10 147k
R11 10k
C21
D5 Schottky 100V 1A
C26
P6 pinhead
GND

5V DC/DC

U6 MC78M05CDT
TO_SOT_Packages_SMD:TO-252-2Lead
IN GND OUT
C8 0.1uF/100V
C24 0.1uF/100V

3.3V DC/DC

U7 TLV70233DBV
TO_SOT_Packages_SMD:SOT-23-5
IN GND EN OUT
3 2
+3.3V
C30 1uF
C31 1uF

Power Stage

D1 D2 D3 BAS21
C9 C10 C11
C14 C15 C16
V_BATT

U1 U2 U3 IR2104
Vcc IN SD_ COM Vb HO Vs LO
IN_U_PWM SD_U_SCK
IN_V_PWM SD_V_MISO
IN_W_PWM SD_W_MOSI
R16 R17 R18 R19 R20 R21
Q1 Q2 Q3 Q4 Q5 Q6
PHASE_U PHASE_V PHASE_W
P13 P14 P15

(!) DC cap bias
C7 470uF/63V
C12 470uF/63V
C13 470uF/63V
C17 0.1uF/100V
C18 0.1uF/100V
C19 0.1uF/100V
V_BATT

Hall, Bemf Sensing

Hall Sensors

+5V
R7 R8 R9 1k
HALL_U HALL_V HALL_W
R36 R37 R38 100
HALL_U_IN HALL_V_IN HALL_W_IN
C2 C4 C6 0.1uF

BEMF Detection

PHASE_U PHASE_V PHASE_W
R1 R3 R5 56k
BEMF_U BEMF_V BEMF_W
R2 R4 R6 4k7
C1 C3 C5 0.1uF

PWR_FLAG PWR_FLAG PWR_FLAG PWR_FLAG PWR_FLAG GNDPWR

bytefactory.eu – Marcus Bauer
Sheet: /
File: bldc.sch

Title: BLDC Controller 1000W 24/36/48V – Atmega328PB

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