IR.SchDoc
IR_OUT

MCU
Motor_MCU.SchDoc

IR_IN

UART_TXD
UART_RXD

LEFT_FORWARD_PWM_OUTPUT
LEFT_REVERSE_PWM_OUTPUT

RIGHT_FORWARD_PWM_OUTPUT
RIGHT_REVERSE_PWM_OUTPUT

LEFT_FAULT_STATUS
RIGHT_FAULT_STATUS

LEFT_DISABLE
RIGHT_DISABLE

Motor_Driver.SchDoc

LEFT_FORWARD_PWM_INPUT
RIGHT_FORWARD_PWM_INPUT

RIGHT_REVERSE_PWM_INPUT
LEFT_REVERSE_PWM_INPUT

LEFT_FAULT_STATUS
RIGHT_FAULT_STATUS

LEFT_DISABLE
RIGHT_DISABLE

LEFT_MOTOR_POSITIVE
LEFT_MOTOR_NEGATIVE
RIGHT_MOTOR_POSITIVE
RIGHT_MOTOR_NEGATIVE

H?

M1+	1
M1-	2
M2+	3
M2-	4

Twin Motor Connector

H1

NC	1	
5V	2	
RXD	3	
GND	4	
TXD	5	
GND	6	
NC	7	
GND	8	
NC	9	
GND	10	

V_5

GND

GND

GND

GND

Comms

Power_Supply.SchDoc

Power supply

P2

V_CHARGER

1	
2	

Header 2

GND

H?

V_BATT

+ve	1
-ve	2

GND

Battery

Motor MCU Schematic

ATXMEGA16A4-AU

Left port labels (inputs/outputs):
- RIGHT_DISABLE — PA0 40
- LEFT_DISABLE — PA1 41
- RIGHT_FAULT_STATUS — PA2 42
- LEFT_FAULT_STATUS — PA3 43
- PA4 44
- PA5 1
- PA6 2
- PA7 3

- PB0 4
- PB1 5
- PB2 6
- PB3 7

- IR_IN — PC0 10
- PC1 11
- PC2 12
- PC3 13
- PC4 14
- PC5 15
- PC6 16
- PC7 17

- PD0 20
- PD1 21
- PD2 22
- UART_RXD — PD3 23
- UART_TXD — PD4 24
- PD5 25
- PD6 26
- PD7 27

Left pin names:
- PA0 (ADC0 / AC0 / AREF)
- PA1 (ADC1 / AC1)
- PA2 (ADC2 / AC2)
- PA3 (ADC3 / AC3)
- PA4 (ADC4 / AC4)
- PA5 (ADC5 / AC5)
- PA6 (ADC6 / AC6)
- PA7 (ADC7 / AC7 / AC0 OUT)
- PB0 (ADC8 / AREF)
- PB1 (ADC9)
- PB2 (ADC10 / DAC0)
- PB3 (ADC11 / DAC1)
- PC0 (OC0A / OC0ALS / SDA)
- PC1 (OC0B / OC0AHS / XCK0 / SCL)
- PC2 (OC0C / OC0BLS / RXD0)
- PC3 (OC0D / OC0BHS / TXD0)
- PC4 (OC0CLS / OC1A / SS)
- PC5 (OC0CHS / OC1B / XCK1 / MOSI)
- PC6 (OC0DLS / RXD1 / MISO)
- PC7 (OC0DHS / TXD1 / SCK / CLKOUT / EVOUT)
- PD0 (OC0A)
- PD1 (OC0B / XCK0)
- PD2 (OC0C / RXD0)
- PD3 (OC0D / TXD0)
- PD4 (OC1A / SS)
- PD5 (OC1B / XCK1 / MOSI)
- PD6 (RXD1 / MISO)
- PD7 (TXD1 / SCK / CLKOUT / EVOUT)

Right pin names:
- PE0 (OC0A / SDA) 28 — LEFT_FORWARD_PWM_OUTPUT
- PE1 (OC0B / XCK0 / SCL) 29 — LEFT_REVERSE_PWM_OUTPUT
- PE2 (OC0C / RXD0) 32 — RIGHT_FORWARD_PWM_OUTPUT
- PE3 (OC0D / TXD0) 33 — RIGHT_REVERSE_PWM_OUTPUT
- PDI (PDI_DATA) 34 — PDI_DATA
- RESET (PDI_CLK) 35 — PDI_CLK
- PR0 (XTAL2 / TOSC2) 36 — PR0
- PR1 (XTAL1 / TOSC1) 37 — PR1
- VCC 9 — V_3.3
- VCC 19
- VCC 31
- AVCC 39 — AVCC
- GND 8
- GND 18
- GND 30
- GND 38

L1 IN_FERRITE CHIP 120 OHM 800mA 0805

V_3.3

C5 100nF   C1 10uF
GND

XMEGA local decoupling caps
C2 100nF   C3 100nF   C4 100nF
V_3.3
GND

Headers

P5 Header 11
- 11 PC1
- 10 PC0
- 9 V_3.3
- 8 GND
- 7 PB3
- 6 PB2
- 5 PB1
- 4 PB0
- 3 PA7
- 2 PA6
- 1 PA5

P7 Header 11
- 11 PD3
- 10 PD4
- 9 PD5
- 8 PD6
- 7 PD7
- 6 PE0
- 5 PE1
- 4 GND
- 3 V_3.3
- 2 PE2
- 1 PE3

P6 Header 11
- 11 PD2
- 10 PD1
- 9 PD0
- 8 V_3.3
- 7 GND
- 6 PC7
- 5 PC6
- 4 PC5
- 3 PC4
- 2 PC3
- 1 PC2

P4 Header 11
- 11 PDI_DATA
- 10 PDI_CLK
- 9 PR0
- 8 PR1
- 7 GND
- 6 AVCC
- 5 PA0
- 4 PA1
- 3 PA2
- 2 PA3
- 1 PA4

P11 Header 3X2
- PDI_DATA 1 2 V_3.3
- 3 4
- PDI_CLK 5 6 GND

P12 Header 2
- 2
- 1 RESET

Disconnect while programming,
reconnect to use the voltage supervisor
and reset push-button

Reset Circuit

V_3.3
R6 10k
S1 FSM2JSMA
RESET
C9 100nF
R7 330R
GND

Voltage Supervisor

U1 MCP130T-300I/TT
- GND — 3 VSS
- RESET — 1 RST
- V_3.3 — 2 VDD
C8 100nF
GND

MOTOR_GND

R9
0R

GND

V_BATT

VR_5

C14
100uF 16V

GND

1 V_IN   FEEDBACK 4
5 ON/OFF
3 GND   OUTPUT   2

TL2575

TP10
YELLOW

L5
Inductor
10mH

D9
Diode BAS70

C15
Cap Pol2
100pF

L2
Inductor
10mH

TP11
YELLOW

V_5

C16
Cap Pol2
100pF

GND

V_CHARGER

D_Charge_Protection
ES2D

R4
5R1

V_BATT

D_Charging
Super Blue

D_Charged
Super Blue

R5
100R

R8
2K

GND

V_BATT

VR_3.3

C17
100uF 16V

GND

1 V_IN   FEEDBACK 4
5 ON/OFF
3 GND   OUTPUT   2

TL2575

YELLOW

TP12

L3
Inductor
10mH

D10
Diode BAS70

C18
Cap Pol2
100pF

L4
Inductor
10mH

TP13
YELLOW

V_3.3

C19
Cap Pol2
100pF

GND

TP9 TP
C7
+
33u
TP14 TP

LEFT_DRIVERA
MC33886VW
V+ 4
V+ 5
V+ 16
CCP 17
AGND 1
PGND 9
PGND 10
PGND 11
PGND 12
GND
MOTOR_GND

V_BATT
C12 10nF
GND

TP15 TP
C10
+
33u
TP16 TP

RIGHT_DRIVERA
MC33886VW
V+ 4
V+ 5
V+ 16
CCP 17
AGND 1
PGND 9
PGND 10
PGND 11
PGND 12
GND
MOTOR_GND

V_BATT
C11 10nF
GND

V_5
R1 10k
LEFT_FAULT_STATUS

MOTOR_GND
V_BATT

TP17 TP

LEFT_DISABLE
V_5

LEFT_DRIVERB
MC33886VW
IN1 3
D2 13
D1 18
IN2 19
FS 2
OUT1 6
OUT1 7
OUT2 14
OUT2 15

D1 5A/40V
D2 5A/40V
LEFT_MOTOR_POSITIVE
TP18 TP
TP19 TP
LEFT_MOTOR_NEGATIVE
D3 5A/40V
D4 5A/40V
MOTOR_GND
V_BATT

TP2 TP

V_3.3
C13 100nF
GND
C6 100nF
V_5

MOTOR_LEVEL_SHIFTER
MAX3001EEUP+
VL 2
VCC 19
I/O VL1 1
I/O VL2 3
I/O VL3 4
I/O VL4 5
I/O VL5 6
I/O VL6 7
I/O VL7 8
I/O VL8 9
I/O VCC1 20
I/O VCC2 18
I/O VCC3 17
I/O VCC4 16
I/O VCC5 15
I/O VCC6 14
I/O VCC7 13
I/O VCC8 12
EN 10
GND 11

TP3 TP
LEFT_FORWARD_PWM_INPUT
LEFT_REVERSE_PWM_INPUT
TP4 TP
TP5 TP
RIGHT_FORWARD_PWM_INPUT
RIGHT_REVERSE_PWM_INPUT
TP7 TP

R3 10k
V_3.3

V_5
R2 10k
RIGHT_FAULT_STATUS

MOTOR_GND
V_BATT

TP6 TP

RIGHT_DISABLE
V_5

RIGHT_DRIVERB
MC33886VW
IN1 3
D2 13
D1 18
IN2 19
FS 2
OUT1 6
OUT1 7
OUT2 14
OUT2 15

D5 5A/40V
D6 5A/40V
RIGHT_MOTOR_POSITIVE
TP20 TP
TP21 TP
RIGHT_MOTOR_NEGATIVE
D7 5A/40V
D8 5A/40V
MOTOR_GND
V_BATT

TP8 TP

Title **Motor Driver**
Drawn by wgl18
Revision: 1
Date: 6/05/2011   Time: 2:31:33 p.m.   Sheet 4 of 5
File: J:\enel429-2011-wackyracers-9\Altium\Schematics\Motor_Driver.SchDoc

ENEL429 Group 9
ECE Department
University of Canterbury
Christchurch 8041
New Zealand

UC
UNIVERSITY OF
CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

IR Module

V_3.3

R_ESD
100R

C_ESD
1uF 16V

GND

3 Vs

2 GND

1 OUT

IR_OUT

TP1
BLACK

TSOP38236

Comment	Description	Designator	Footprint	LibRef	Quantity
ATXMEGA16A4-AU			TQFP80P1200X1200X120-44N	ATXMEGA16A4-AU	1
10uF	CAP 10uF 10% 10V X5R 0805	C1	0805	CP_10uF 0805	1
100nF	CAP CER .10UF 50V X5R 0603	C2, C3, C4, C5, C6, C8, C9, C13	0603	CP_100nF 0603	8
CP_TANT_33uF	CAP TANT 33UF 20V 10% SMD	C7, C10	6032	CP_TANT_33UF_20V	2
10nF	CAP CER 10000PF 100V X7R 0603	C11, C12	0603	CP_10nF 0603	2
100uF 16V	SM Tantalum Cap	C14, C17	TANT7343	TANT100uF_16V_7343	2
Cap Pol2	Polarized Capacitor (Axial)	C15, C16, C18, C19	POLAR0.8	Cap Pol2	4
1uF 16V	SM Tantalum Cap	C_ESD	TANT3216	TANT1uF_16V_3216	1
5A/ 40V	DIODE SCHOTTKY 5A 40V SMC	D1, D2, D3, D4, D5, D6, D7, D8	DIODE_SMC	DS_SSC54-E3/ 57T	8
Diode BAS70	Silicon AF Schottky Diode for High-Speed Switching	D9, D10	SOT95P240-3N	Diode BAS70	2
Super Blue	LED 0805 Super Blue	D_Charged, D_Charging	LED0805	LED0805_S_BLUE	2
ES2D	DIODE ULTRA FAST 2A 200V SMB	D_Charge_Protection	DIODE_SMB	ES2D-E3/ 52T	1
Comms	Header, IDC 10-Pin	H1	918510x323	Header 10	1
Battery	5.08mm Pluggable Terminal Header	H?	TMHDR2	AVR ISP Header 2	1
Twin Motor Connector	5.08mm Pluggable Terminal Header	H?	TMHDR4	AVR ISP Header 4	1
TSOP38236		IR Module	TSOP38236 IR Receiver	TSOP38236	1
IN_FERRITE CHIP 120 OHM 800mA 0805	FERRITE CHIP 120 OHM 800mA 0805	L1	0805	IN_FERRITE CHIP 120 OHM 800mA 0805	1
Inductor	Inductor	L2, L3, L4, L5	INDC1005AL	Inductor	4
MC33886VW		LEFT_DRIVER, RIGHT_DRIVER	SOP127P1420X340_HS-20N	MC33886VW	2
MAX3001EEUP+		MOTOR_LEVEL_SHIFTER	TSOP65P640X110-20N	MAX3001EEUP+	1
Header 2	Header, 2-Pin	P2, P12	HDR1X2	Header 2	2
Header 11	Header, 11-Pin	P4, P5, P6, P7	HDR1X11	Header 11	4
Header 3X2	Header, 3-Pin, Dual row	P11	HDR2X3	Header 3X2	1
10k	RES 10.0K OHM 1/ 10W 1% 0603 SMD	R1, R2, R3, R6	0603	RS_10k 0603	4
5R1	0603 Resistor	R4	R0603	5R1_R0603	1
100R	0603 Resistor	R5, R_ESD	R0603	100R_R0603	2
330R	RES 330 OHM 1/ 10W 1% 0603 SMD	R7	0603	RS_330R 0603	1
2K	0603 Resistor	R8	R0603	2K_R0603	1
0R	0603 Resistor	R9	R0603	0R_R0603	1
FSM2JSMA	DPST SMD Switch	S1	FSM2JSMA	SW_FSM2JSMA	1
BLACK	TEST POINT PC MINI .040"D BLACK	TP1	testpoint-small	TP5001	1
YELLOW	TEST POINT PC MINI .040"D YELLOW	TP10, TP11, TP12, TP13	testpoint-small	TP5004	4
MCP130T-300I/ TT	Microcontroller Supervisory Circuit with Open Drain Output, 3-Pin SOT-23, Industrial Temperature, Tape and Reel	U1	SOT-23-TT3_N	MCP130T-300I/ TT	1
TL2575		VR_3.3, VR_5		tl2575	2