Sheet 1:

- C2 10n
- 6k2 R4
- 15k R3
- C1 6n8
- IC1A NCS2333DR2G
- P1_3.3/4.5B
- P1-ANA/2.2D
- R2 10k
- R1 5k
- GND
- 5V/2.6D
- IC1P
- NCS2333DR2G
- C4 10n
- R6 6k2
- R5 15k
- C3 6n8
- IC1B NCS2333DR2G
- P2_3.3/4.5B
- P2-ANA/2.4D
- R8 10k
- R7 5k
- GND

- 12V_RADIATORS
- BYW51COOL
- RAD1_12/2.5B
- RAD2_12/2.5C
- D7
- MOS5 IPP60R600P7COOL
- MOS4 IPP60R600P7COOL
- RAD1_3.3
- RAD2_3.B
- GND/2.5A
- GND/2.5A

Comparators:

- LM339PWR
- F1_3.3/4.3C
- REF_1.6V
- U4G1
- R18 10k
- 5V
- F1_5/2.1C
- F2_3.3/4.5C
- REF_1.6V
- U4G2
- R19 10k
- F2_5/2.1C
- F3_3.3/4.5C
- REF_1.6V
- U4G3
- R20 10k
- F3_5/2.1B
- U4G5 VCC VEE LM339PWR
- 5V/2.6D
- GND

- F5_3.3/4.5B
- REF_1.6V
- U7G1
- R26 10k
- 5V
- F5_5/2.1D
- F6_3.3/4.5B
- REF_1.6V
- U7G2
- R27 10k
- F6_5/2.2D
- U7G5 VCC VEE LM339PWR
- 5V/2.6D
- GND

- R25 15k
- 5V
- REF_1.6V
- R28 10k
- GND

PCB Name:	LV_ACCUMULATOR	
Sheet Name:	PWM Conversion	
Sheet: 1/6		Designed by:
Ver: V2.0		Damiano Tessaro

PET-02-XX-X-VT-LC

CNS1
- 2 | 17*8 — V+
- 1 | 9*8 — GND

CNS2 — PET-02-XX-X-VT-LC
- OUT-LVMS | 9*8 — 1
- IN_LVMS | 17*8 — 2

CANH1/4.1A — 120 R12 — CANL1/4.1A

CANH3/4.1A — 120 R11 — CANL3/4.1A

GND/1.7C — J–GND — GND/3.2C

EXTERNAL FAN

FAN3 — 430450612
- 12V-FAN | 1 4 | 12V-FAN
- F3_5 | 2 5 |
- GND | 3 6 | GND

FAN2 — 430450612
- 12V-FAN | 1 4 | 12V-FAN
- F2_5 | 2 5 |
- GND | 3 6 | GND

FAN1 — 430450612
- 12V-FAN | 1 4 | 12V-FAN
- F1_5 | 2 5 |
- GND | 3 6 | GND

INTERNAL FAN

IN-FANS — 430450612
- 12V-FAN | 1 4 | 12V-FAN
- F5_5 | 2 5 | F6_5
- GND | 3 6 | GND

BALANCE

BALANCE2
- P$5 V-BAT4
- P$4 V-BAT3
- P$3 V-BAT2
- P$2 V-BAT1
- P$1 V-BAT0

SWITCH PSS

SW-PSS — 430450612
- V+_F | 1 4 | V+_PSS
- | 2 5 |
- | 3 6 |

PUMPS

PUMPS — 430450612
- 24V-PUMPS | 1 4 | 24V-PUMPS
- P1-ANA | 2 5 | P2-ANA
- GND | 3 6 | GND

CAN

CAN1 — 430450612
- 12V-CAN | 1 4 | 12V-CAN
- CANH1 | 2 5 | CANL1
- GND | 3 6 | GND

CAN2 — 430450612
- 12V-CAN | 1 4 | 12V-CAN
- CANH3 | 2 5 | CANL3
- GND | 3 6 | GND

INVERTERS

INV1 — 430450612
- 24V-INV | 1 4 | 24V-INV
- CANH1 | 2 5 | CANL1
- GND | 3 6 | GND

INV2 — 430450612
- 24V-INV | 1 4 | 24V-INV
- CANH1 | 2 5 | CANL1
- GND | 3 6 | GND

CHARGE

PET-02-XX-X-VT-LC

CNS3
- 2 | 17*8 — V+
- 1 | 9*8 — GND

BALANCE1
- P$5 V-BAT4
- P$4 V-BAT3
- P$3 V-BAT2
- P$2 V-BAT1
- P$1 V-BAT0

DATA LOG SHUTDOWN

LOG+SH — 430450612
- GND | 1 4 | 12V-DL
- GND | 2 5 | 12V-SH
- GND | 3 6 | 12V-SH

RADIATORS

RAD1 — 430450612
- RAD1_12 | 1 4 | 12V-RAD
- RAD1_12 | 2 5 | 12V-RAD
- RAD1_12 | 3 6 | 12V-RAD

RAD2 — 430450612
- RAD2_12 | 1 4 | 12V-RAD
- RAD2_12 | 2 5 | 12V-RAD
- RAD2_12 | 3 6 | 12V-RAD

V+/3.2A — R40 — P$1
V+_F/3.4B — R39 — P$2
GND/1.7C — MEASURE

HALL SENSOR

JST_B5B-PH — HALL-SENS
- P$5
- P$4
- P$3
- P$2 — GND
- P$1 — 3.3V

10k R14 — S_HALL/4.3C
C26 100n
GND

CNS14 — IPL1-105-01-F-D-K
- 5V_USB P$1 | 1 6 | P$6 5V_USB
- GND P$2 | 2 7 | P$7 GND
- SWO P$3 | 3 8 | P$8 SWCLK
- NRST_OUT P$4 | 4 9 | P$9 SWDIO
- USB_RX P$5 | 5 10 | P$10 USB_TX

T SENSORS

T_BATT
- T_BATT1/4.3C — 10k R38 — 5V | 1 4 | 5V
- | 2 5 |
- GND | 3 6 | GND — 10k R32 — T_BATT2/4.5C
- C30 10k / 100n

T_DCDC
- T_DCDC12/4.5C — 10k R30 — 5V | 1 4 | 5V
- 100n | 2 5 |
- GND | 3 6 | GND — 10k R31 — T_DCDC24/4.5C
- C29 100n
- C28 100n / C27 100n

PCB Name: LV_ACCUMULATOR
Sheet Name: Jumper
Sheet: 2/6
Ver: V2.0
Designed by:

V+/2.6C

F_MAIN
40A
IN_LVMS/2.2A

F_PSS
2A
V+_F/2.6D

U$10
SMCJ40CA-TR
GND

F_FANS
10.5A
12V-FAN/2.2B

F_CAN
10A
12V-CAN/4.7B

12V/5.1A

F_RAD
6A
12V-RAD/2.7B

C23 C22 C21 C20
10u 10u 10u 10u
GND

F_SHDW
5A
12V-SH/2.5E

F_DATA-LOG
2A
12V-DL/2.5E

F_PUMPS
FUSE
24V-PUMPS/2.4C

24V/5.3D

C25 C24
10u 10u
GND

F_INVERTERS
FUSE
24V-INV/2.5B

OUT-LVMS/2.2A

OUT_RELAY

87A 30 87

J1 1393310-3

F_12V
30A
IN_DCDC_12V/5.1B

F24_V
15A
IN_DCDC_24V/5.2D

86 85

V+_F/2.6D
D5

RELAY/4.5C

DMN15H310SE-13
MOS1

R15 10k

GND

GND

U0G$1

SOCKET_RAM

5V   5V
3.3V   3.3V
GND@1   GND

CANH3   CANH3
CANL3   CANL3
CANH1   CANH1
CANL1   CANL1

USB_RX   UART4_RX
USB_TX   UART4_TX

NRST   NRST
SWDIO   SWDIO
SWO   SWO
SWCLK   SWCLK

PC10
PC12
PC11
LTC_CLK   PD3
SD_DETECT   PD5   PD2   SDMMC2_CS
SDMMC2_CMD   PD7   PD4   LTC_CS
PD6   SDMMC2_CK
PB4

U0G$2

SOCKET_RAM

PB5   PB6
PB7   GND@2   GND
BOOT0
PA10
PA9
PC7   I_ERR
PC6   BUZZER
RAD1_3.3   PB8   PD15
RAD2_3.3   PB9   PD14
PE0   PD13   P1_3.3
PE1   PD12   P2_3.3
PD11
PD10
PB15
PB14   SDMMC2_D0
PE2
GND@3   GND
PE5
PE6
PB11   F5_3.3
GND   GND@5   PB10   F6_3.3
GND@4   GND
PC0
PC1   PA6   F3_3.3
LTC_MISO   PC2   PC4   RELAY
LTC_MOSI   PC3   PA4
GNDA   PA5   F2_3.3
3.3VA   PA7   T_BATT2
PA0   PC5
F1_3.3   PA1   PB0   T_DCDC12
S_HALL   PA2   PB1   T_DCDC24
T_BATT1   PA3   PB2
SHIELD   S1*2   GND

12V-CAN/3.3C
D6
BUZZER
BUZZER
DMN15H310SE-13
MOS3
10k   R16
GND
GND/5.1B

LED
V+_PSS/2.4B   P$1
P$2
V+_PSS   P$3
GND   P$4

I_ERR
MOS2
DMN15H310SE-13
LED_ERR
330   R9
GND
GND

U6
DM3AT-SF-PEJM5

3.3V
47k   R13
47k   R10

3.3V   4   VDD
SDMMC2_D0   7   DAT0
8   DAT1
1   DAT2
SDMMC2_CS   2   CD/DAT3
SDMMC2_CMD   3   CMD
SDMMC2_CK   5   CLK
GND   6   VSS
GND   P1*4   SHIELD

3.3V   SWA   A
SD_DETECT   SWB   B
47k   R29
GND

3.3V/2.7B
3.3V/2.7B
C11   C19
10u   1u
GND

RST1
J5
NRST   NRST_OUT/2.7C

Schematic diagram — DC/DC converter section

Grid reference numbers (top and bottom): 1 2 3 4 5 6 7 8
Grid reference letters (left and right): A B C D E

U1 — CFB400W

Left pins: +S, -S, -ON/OFF, +ON/OFF, AUX, TRIM, IOG, PC/NC
Right pins: +VOUT, +VOUT, +VOUT, -VOUT, -VOUT, -VOUT, +VIN, -VIN

Labels: 12V/3.1C, GND/4.7C, IN_DCDC_12V/3.7B, GND/4.7C
R23 10k, R24 6k2, R22 6k8
+VOUT → 12V/3.1C
-VOUT → GND/6.3B
+VIN → IN_DCDC_12V/3.7B
-VIN → GND/6.3B
U$18 SMCJ40CA-TR

U2 — CQB150W

Left pins: ON/OFF, +VIN, -VIN
Right pins: +VOUT, -VOUT
Bottom pins: -SEN, TRM, +SEN

Labels: IN_DCDC_24V/3.7B, U$19 SMCJ40CA-TR, GND/4.7C
+VOUT → 24V/3.1D
-VOUT → GND/6.3B
R21 10K

Top right capacitors

IN_DCDC_12V/3.7B → C5 1000u → GND/4.7C
IN_DCDC_24V/3.7B → C7 1000u → GND/6.3B

12V/3.1C → C6 10u, C9 1u → GND/4.7C → GND
24V/3.1D → C8 10u, C10 1u → GND/4.7C → GND

U3 — PSS

J6
5V_USB → N$10 → SW
V+_PSS → V_IN1
5V_USB → V_IN2
5V, 3V3 → 5V, 3.3V
GND

PCB Name: LV_ACCUMULATOR
Sheet Name: DC/DC
Sheet: 5/6
Ver: V2.0
Designed by:

24-Apr-20 22:42 C:\Users\damyt\Google Drive\E-Agle TRT - Drive\Work Groups\Low Voltage Hardware [LVH]\PCB\LV Accumulator_Project\V4.0\BMS_LV.sch (Sheet: 5/6)

U5 — LTC6810-2

Pin	Left		Right	Pin
1	V-	GND	V-	44 GND
2	NC		V-	43 GND
3	V+	C4	WDT	42
4	C6	C4	SDI	41 LTC_MOSI
5	S6		SDO	40 LTC_MISO
6	C5	C4	A3	39 GND
7	S5		A2	38 GND
8	C4	C4	SCK	37 LTC_CLK
9	S4		CSB	36 LTC_CS
10	C3	C3	A1	35 GND
11	S3		A0	34 GND
12	C2	C2	DRIVE	33
13	S2		VREG	32
14	C1	C1	VREF2	31
15	S1		VREF1	30
16	C0	C0	V-	29 GND
17	S0		V-	28 GND
18	GPIO1		ISOMD	27 GND
19	GPIO2		DTEN	26 GND
20	GPIO3		GPIO4	25
21	V-	GND	V-	24 GND
22	V-	GND	V-	23 GND

R17 10k → 3.3V

C16 1u   C17 1u   C18 1u → 5V

GND GND GND

V-BAT4/2.5D — R37 100 — C12 10n → C4
V-BAT3/2.5D — R36 100 — C13 10n → C3
V-BAT2/2.5D — R35 100 — C14 10n → C2
V-BAT1/2.5D — R34 100 — C15 10n → C1
V-BAT0/2.5D — R33 100 → C0