TLO Rock mainboard and motor drivers

The mainboard is based around a STM32G441KBT3 MCU. The MCU is powered from the mainboard's micro USB port through a NCP163C regulator to drop the voltage from 5V to 3.3V. All signals between the motor driver side and MCU side are isolated through MAX14930 isolators. The USB connection is also protected by a CM1223 TVS diode package. MCU is programmed through a port (J2) on the mainboard using STlink.
Ground connections on MCU side are marked as GND and GNDB on the driver side. Grounds are isolated from each other.

Motor drivers used are DRV8243-Q1 in QFN package. Motor drivers are operated in bridge mode in control mode 0 (set via Rmode 0 ohm) where input 1 (EN_IN1) is an isolated PWM signal from the MCU and input 2 (PH_IN2) is the input for direction. Motors are connected between OUT1 and OUT2. SLEEP_N is also connected to the MCU and triggered low at startup for about 30 microseconds. All drivers can be disabled via DRVOFF pin. Output current limit level is set to 4 using a 47K resistor between ITRIP and GNDB. All signals between MCU and motor drivers are isolated. The board has a total of 3 motor drivers, each with identical schematics.

All battery side electronics that require a 5V supply are powered via a TPS54227 switching regulator.

Firmware can be found in our Git repository.

Pinouts for all connections:

J1 Micro USB

1. 5V
2. Data -
3. Data +
4. ID, not used
5. GND
6. Shielding connected to GND

J2 programmer connection

1. 3.3V
2. SWDIO
3. GND
4. SWCLK
5. GND
6. n/c
7. n/c
8. n/c

9. GND
10. NRST

J3 thrower PWM

1. GNDB
2. Thrower PWM from MCU, isolated
3. n/c
4. n/c

J4 Motor 1 encoder

1. GND
2. 3.3V
3. Encoder connection A
4. Encoder connection B

J5 Motor 2 encoder

5. GND
6. 3.3V
7. Encoder connection A
8. Encoder connection B

J6 Motor 3 encoder

9. GND
10. 3.3V
11. Encoder connection A
12. Encoder connection B

J7 thrower servo

1. 5V, motor side
2. Servo PWM form MCU, isolated
3. GNDB
4. GNDB

J8 IR thrower IR detector

1. 5V from USB
2. IR in from sensor
3. GND
4. GND

J9 Accelerometer

1. 3.3V

2. I2C_SDA
3. GND
4. I2C_SCL

Solder pads:

P1 - Battery +
P2 - Battery -
P3 - Motor 1 +
P4 - Motor 1 -
P5 - Motor 2 +
P6 - Motor 2 -
P7 - Motor 3 +
P8 - Motor 3 -