

BSPD

Opamps should not get any input voltages higher than $V_{dd}-1.5$ which in our case is 10.5V of the 12V.

To secure that the logic gates don't give out V_{dd} to the op amps the logic gates V_{dd} is regulated down to 10.47V.

Break pedals should only operate from 1 to 10V under normal conditions.

Every input and output goes through a fuse to protect the circuit from over current. Every input is checking for short circuit and open circuit with opamps. When an open circuit happens the opamp side is pulled down to ground and thus simulating a short circuit to ground. 0.64V is considered short circuit to ground, 10.43V is considered short circuit for the break pedals. Lem sensor goes from ~0.63V to 3.84V under normal operation. Everything above or below this value is considered short circuit or too high current draw from the battery thus shutting down.

Under normal operation both break pedal sensors will be checked. If one of them goes above a certain voltage e.g. $R_{20}/(R_{20}+R_1)$ while current draw is above 40A (2.55V from the lem sensor) The vehicle will shutdown.

To ensure that abnormal behavior is priorities, every short, open and over current, triggers the charge circuit directly. This is ensured by the logic in the circuit. If a error is present for roughly 300ms the vehicle will shutdown. If no error is present the charge circuit discharges through a low resistor and a mosfet.

The output of the circuit goes to LOW when a error is present and thus closes a relay on the shutdown board. So if the output fuse breaks the shutdown circuit will be activated.

R14, R15, R20 and R1 can be changed to change the position where the break pedal sensor triggers the opamp.

R8 and R9, and, R7 and C1, can be used to change the charge time.