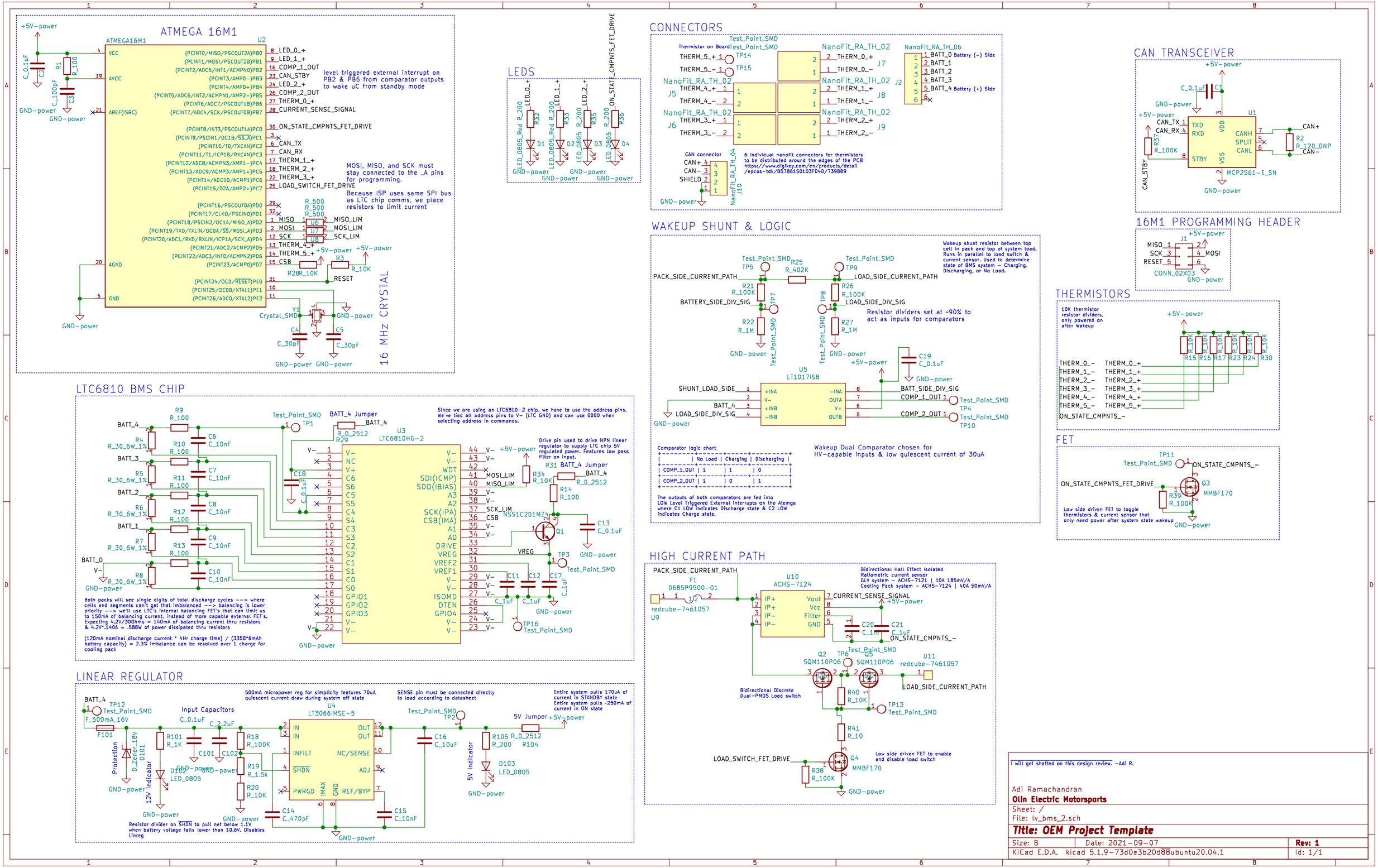
ATMEGA 16M1
ATMEGA16M1
U2
level triggered external interrupt on PB2 & PB5 from comparator outputs to wake uC from standby mode
MOSI, MISO, and SCK must stay connected to the _A pins for programming.
Because ISP uses same SPI bus as LTC chip comms, we place resistors to limit current
16 MHz CRYSTAL
LEDS
CONNECTORS
Thermistor on Board
CAN connector
6 individual nanofit connectors for thermistors to be distributed around the edges of the PCB
https://www.digikey.com/en/products/detail/epcos-tdk/B57861S0103F040/739889
CAN TRANSCEIVER
MCP2561-E_SN
16M1 PROGRAMMING HEADER
CONN_02X03
THERMISTORS
10K thermistor resistor dividers, only powered on after Wakeup
FET
Low side driven FET to toggle thermistors & current sensor that only need power after system state wakeup
WAKEUP SHUNT & LOGIC
Wakeup shunt resistor between top cell in pack and top of system load. Runs in parallel to load switch & current sensor. Used to determine state of BMS system - Charging, Discharging, or No Load.
Resistor dividers set at ~90% to act as inputs for comparators
LT1017ISB
Comparator logic chart
	No Load	Charging	Discharging
COMP_1_OUT	1	1	0
COMP_2_OUT	1	0	1
The outputs of both comparators are fed into LOW Level Triggered External Interrupts on the Atemga where C1 LOW indicates Discharge state & C2 LOW indicates Charge state.
Wakeup Dual Comparator chosen for HV-capable inputs & low quiescent current of 30uA
LTC6810 BMS CHIP
LTC6810HG-2
Since we are using an LTC6810-2 chip, we have to use the address pins. We've tied all address pins to V- (LTC GND) and can use 0000 when selecting address in commands.
Drive pin used to drive NPN linear regulator to supply LTC chip 5V regulated power. Features low pass filter on input.
Both packs will see single digits of total discharge cycles --> where cells and segments can't get that imbalanced --> balancing is lower priority --> we'll use LTC's internal balancing FET's that can limit us to 150mA of balancing current. Instead of more capable external FET's. Expecting 4.2V/30Ohms = 140mA of balancing current thru resistors & 4.2V*.140A = .588W of power dissipated thru resistors
(120mA nominal discharge current * 4Hr charge time) / (3350*6mAh battery capacity) = 2.3% imbalance can be resolved over 1 charge for cooling pack
HIGH CURRENT PATH
Bidirectional Hall Effect Isolated Ratiometric current sensor
GLV system - ACHS-7121 | 10A 185mV/A
Cooling Pack system - ACHS-7124 | 40A 50mV/A
ACHS-7124
Bidirectional Discrete Dual-PMOS Load switch
Low side driven FET to enable and disable load switch
LINEAR REGULATOR
500mA micropower reg for simplicity features 70uA quiescent current draw during system off state
SENSE pin must be connected directly to load according to datasheet
Entire system pulls 170uA of current in STANDBY state
Entire system pulls ~250mA of current in ON state
LT3066IMSE-5
Resistor divider on SHDN to pull net below 1.1V when battery voltage falls lower than 10.6V. Disables Linreg
I will get shafted on this design review. -Adi R.
Adi Ramachandran
Olin Electric Motorsports
Sheet: /
File: lv_bms_2.sch
Title: OEM Project Template
Size: B
Date: 2021-09-07
Rev: 1
KiCad E.D.A. kicad 5.1.9-73d0e3b20d88ubuntu20.04.1
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