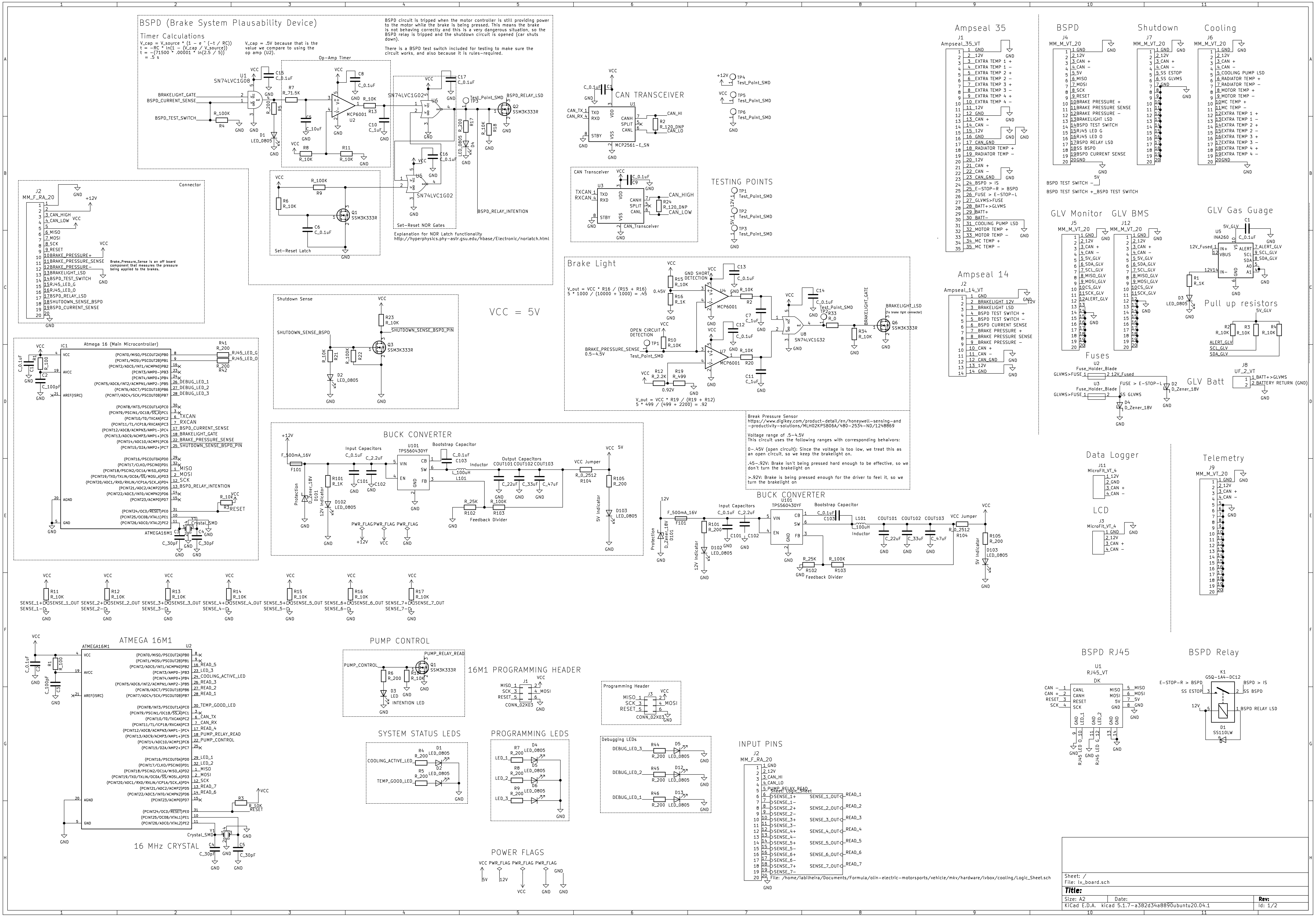

BSPD (Brake System Plausability Device)

Timer Calculations

V_cap = V_source * (1 - e ^ (-t / RC))
t = -RC * ln(1 - (V_cap / V_source))
t = -(71500 * .00001 * ln(2.5 / 5))
  = .5 s

V_cap = .5V because that is the value we compare to using the op amp (U2).

BSPD circuit is tripped when the motor controller is still providing power to the motor while the brake is being pressed. This means the brake is not behaving correctly and this is a very dangerous situation, so the BSPD relay is tripped and the shutdown circuit is opened (car shuts down).

There is a BSPD test switch included for testing to make sure the circuit works, and also because it is rules-required.

Explanation for NOR Latch functionality
http://hyperphysics.phy-astr.gsu.edu/hbase/Electronic/norlatch.html

Brake_Pressure_Sense is an off board component that measures the pressure being applied to the brakes.

V_out = VCC * R16 / (R15 + R16)
5 * 1000 / (10000 + 1000) = .45

V_out = VCC * R19 / (R19 + R12)
5 * 499 / (499 + 2200) = .92

Break Pressure Sensor
https://www.digikey.com/product-detail/en/honeywell-sensing-and-productivity-solutions/MLH02KPSB06A/480-2534-ND/1248869

Voltage range of .5-4.5V
This circuit uses the following ranges with corresponding behaivors:

0-.45V (open circuit): Since the voltage is too low, we treat this as an open circuit, so we keep the brakelight on.

.45-.92V: Brake isn't being pressed hard enough to be effective, so we don't turn the brakelight on

>.92V: Brake is being pressed enough for the driver to feel it, so we turn the brakelight on

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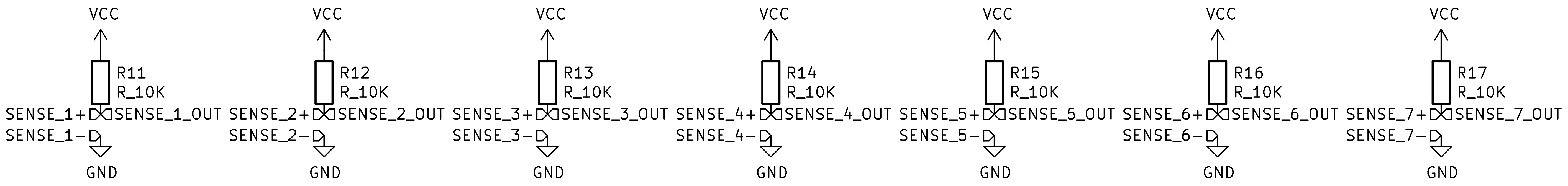

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Title: Cooling Pressure and Temperature Sensing Board

Size: A4   Date: 2019-11-18   **Rev: 2**
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