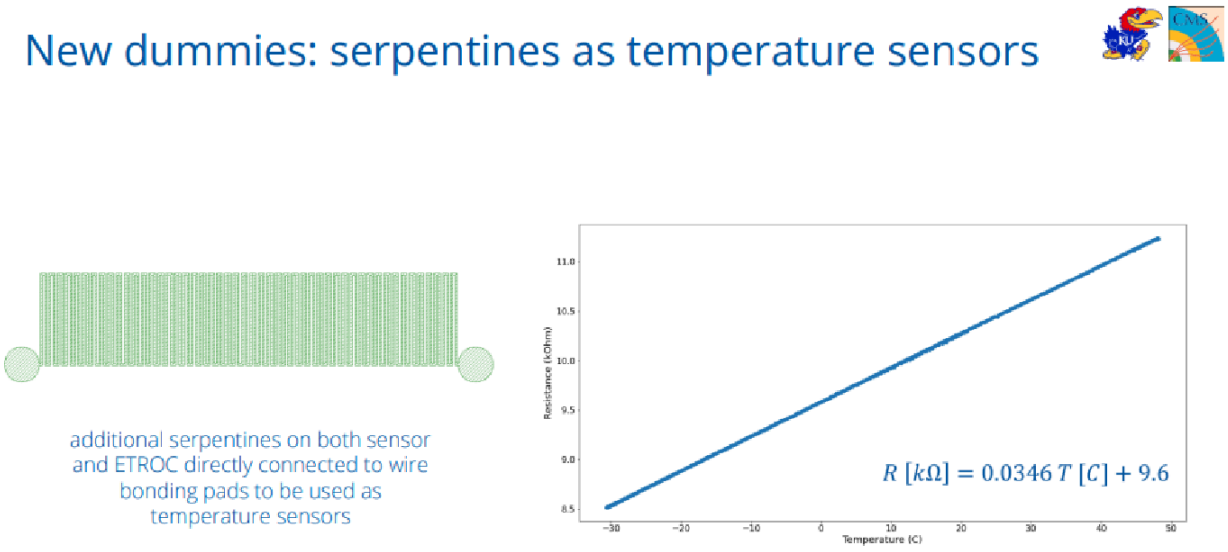
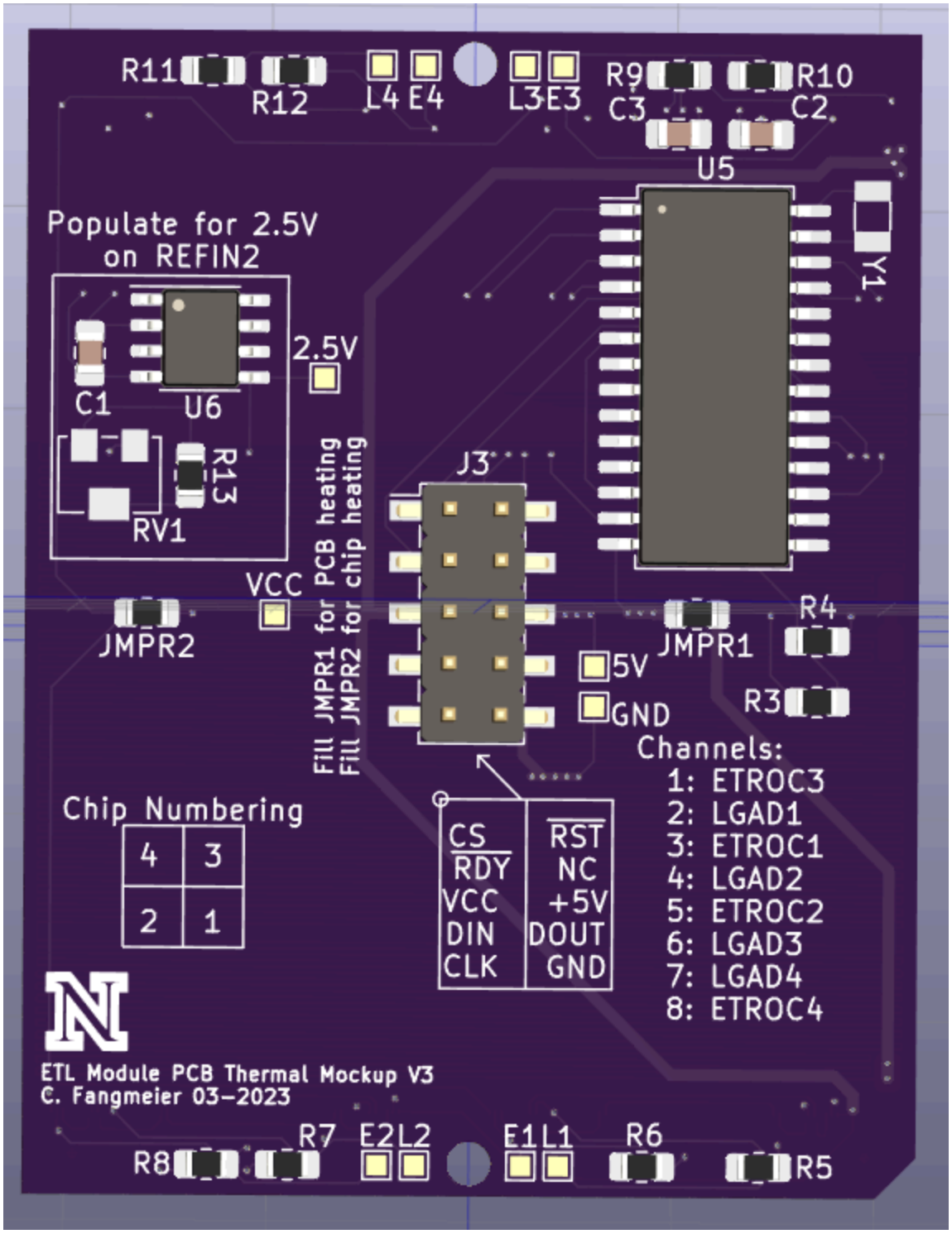
Thermal Mockup Module PCB

The Tamale Thermal Mockup Module PCB is designed to exploit the embedded temperature sensors in the new KU silicon dummies. Each ETROC and each LGAD have four of these sensors, one in each quadrant. These are linked in series to give an average temperature over the whole chip. The measurement is performed by creating a voltage divider with a fixed resistance resistor and measuring the divided voltage with an AD7718 24-bit ADC. This chip has a SPI interface which can be utilized by an Arduino or other microcontroller.



The second main feature of the PCB is an embedded heating element. This can be activated by populating JMPR1 and applying power to VCC. The expected nominal VCC voltage is 9V, but this may vary from vendor to vendor as the trace resistance can vary slightly. To instead use the embedded heating elements in the ETROC dummies, populate JMPR2. In this case, VCC depends on the number heaters engaged by missing bump bonds, roughly $V=\mathrm{sqrt}(3.2*150*N_{heaters} / 4)$.

The form factor of the PCB is the same as a real Module PCB except it is standard PCB thickness, rather than the thinner 0.5mm thick board anticipated for the real detector. Power and data are transmitted over a 10 pin 2.56mm pitch pin header located in the center on the top of the board. Renderings of the board follow. Design files are available here.


R11
R12
L4
E4
L3
E3
R9
R10
C3
C2
U5
Y1
Populate for 2.5V
on REFIN2
2.5V
C1
U6
R13
RV1
J3
VCC
JMPR2
Fill JMPR1 for PCB heating
Fill JMPR2 for chip heating
JMPR1
R4
5V
GND
R3
Channels:
1: ETROC3
2: LGAD1
3: ETROC1
4: LGAD2
5: ETROC2
6: LGAD3
7: LGAD4
8: ETROC4
Chip Numbering
4
3
2
1
CS
RDY
VCC
DIN
CLK
RST
NC
+5V
DOUT
GND
ETL Module PCB Thermal Mockup V3
C. Fangmeier 03-2023
R7
E2
L2
E1
L1
R6
R8
R5