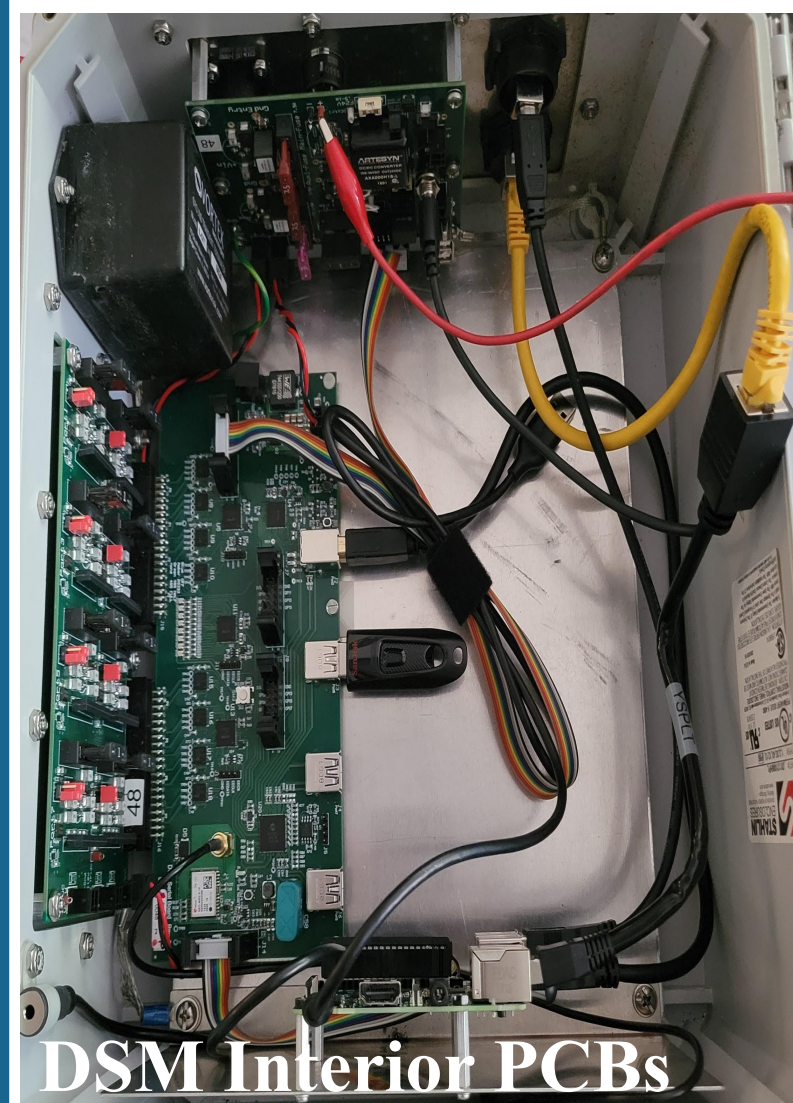


EOL's Data Sampling Module (DSM) Power PCB



Christopher Amankwaa

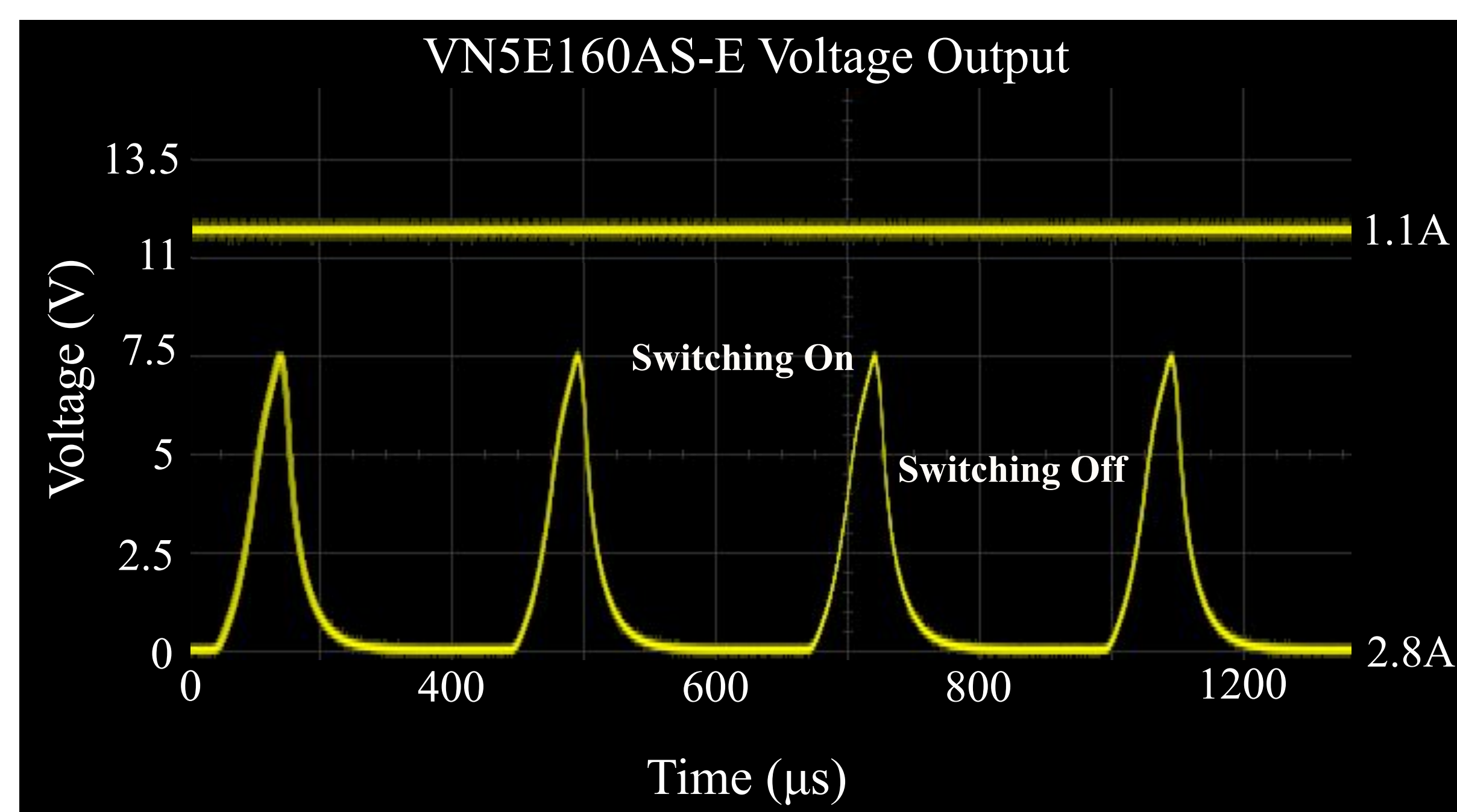
BACKGROUND



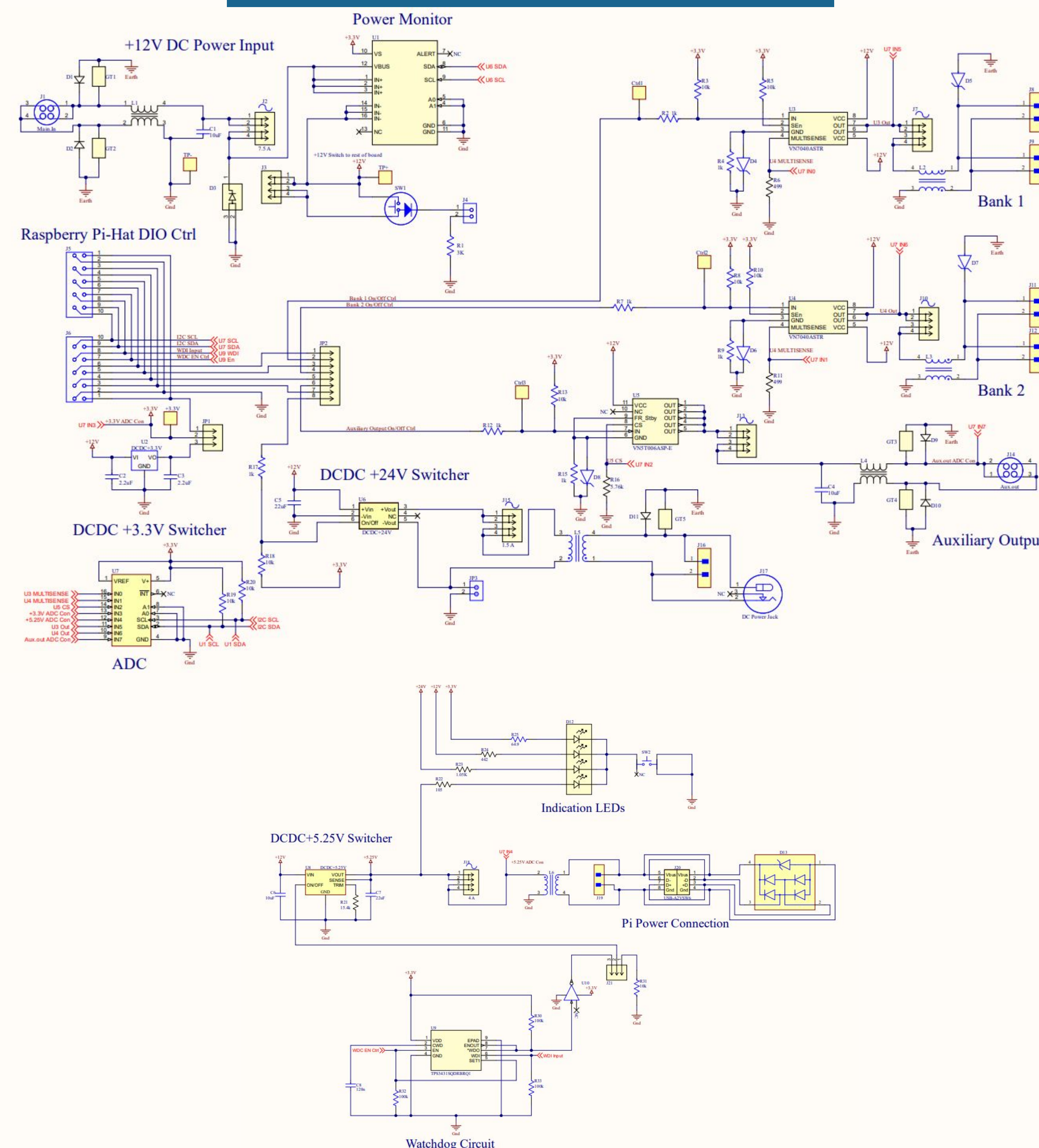
EOL has over 60 DSM (data systems) that monitor and collect data on temperature, air pressure, and wind speed. The PCB that delivers power to these sensors and the DSM CPU is unreliable at high current, due to the overheating of the switching transistor (VN5E160AS-E), which causes it to shut off. Thus, the DSM stops collecting data, until the part cools. This occurs due to a large on resistance (R_{on}) causing high temperatures at high currents.

OBJECTIVES & METHODS

- Create a PCB that can handle the originally intended currents of 5 to 7 Amps
- Find new parts for reverse polarity protection, as well as current monitoring
- Test a range of currents with the original transistors (See plot below)
- Find new transistors with sufficiently low R_{on} based on the original transistor test
- Test new transistor with a larger range of currents
- Recreate original schematic in Altium Designer
- Update new schematic with additional parts

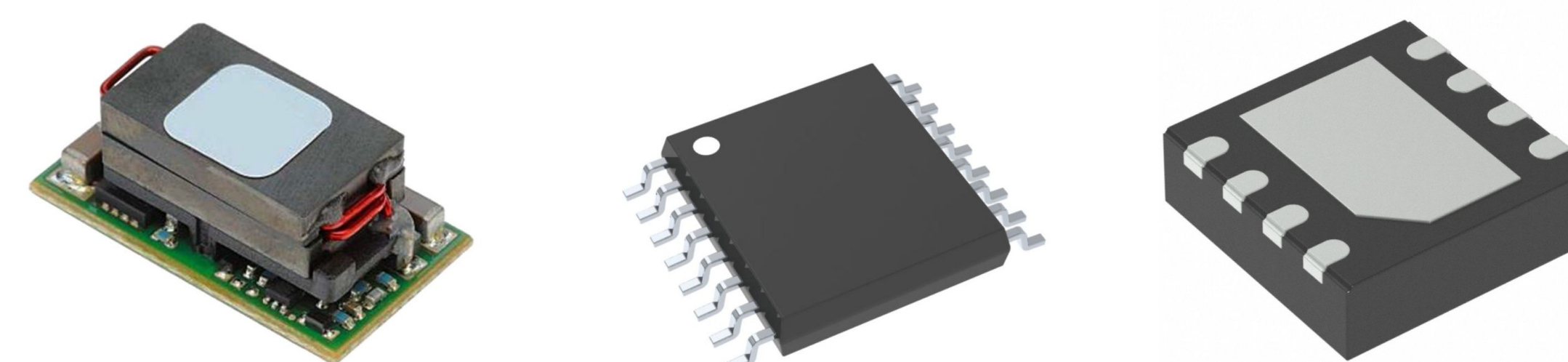


NEW SCHEMATIC

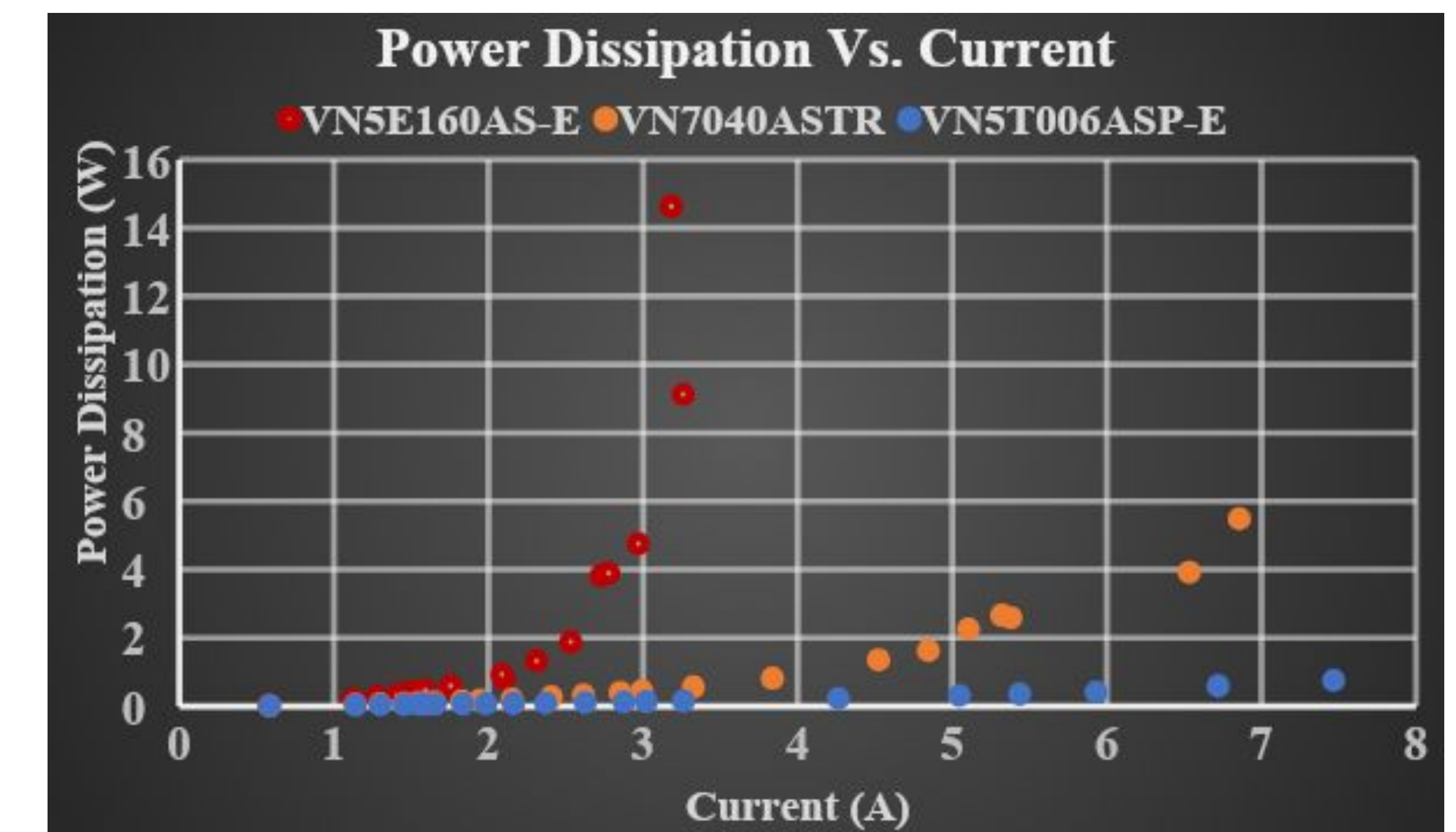


ADDITIONAL PARTS

- ◆ Watchdog Timer
- ◆ Analog to Digital Converter
- ◆ LED
- ◆ Rectifying Diode
- ◆ Voltage Switcher
- ◆ High-side Driver Transistor
- ◆ Power Monitor
- ◆ New Fuse Holders



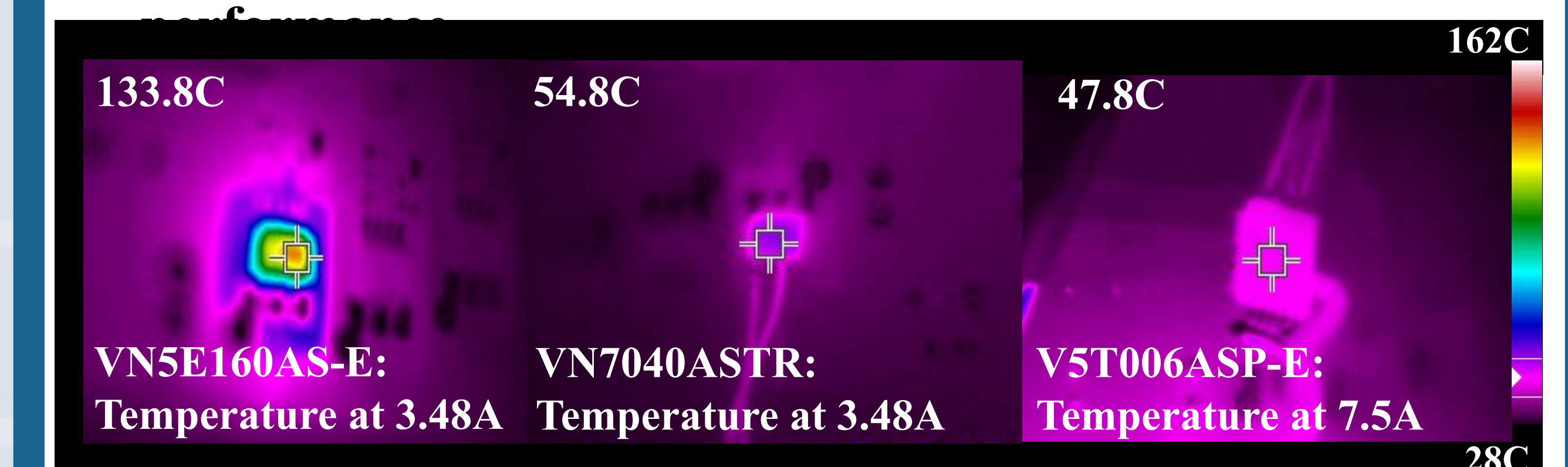
RESULTS



- VN5E160AS-E (160 m Ω Transistor) fails at 2.74 Amps (Original Transistor)
- VN7040ASTR (40 m Ω Transistor) continues to work till 5.3 Amps
- VN5T006ASP-E (6 m Ω Transistor) functions well past 7.5 Amps
- Power dissipation is proportional to temperature

CONCLUSIONS

- The PCB with the VN7040ASTR was 80C cooler at 3.48 Amps than the same PCB with the VN5E160AS-E
- 93% decrease in power dissipation at 3.48 Amps
- VN5T006ASP-E is 47C at 7.5 Amps
- Created new current and power monitoring capabilities and circuit protection for better visibility of the DSM's



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