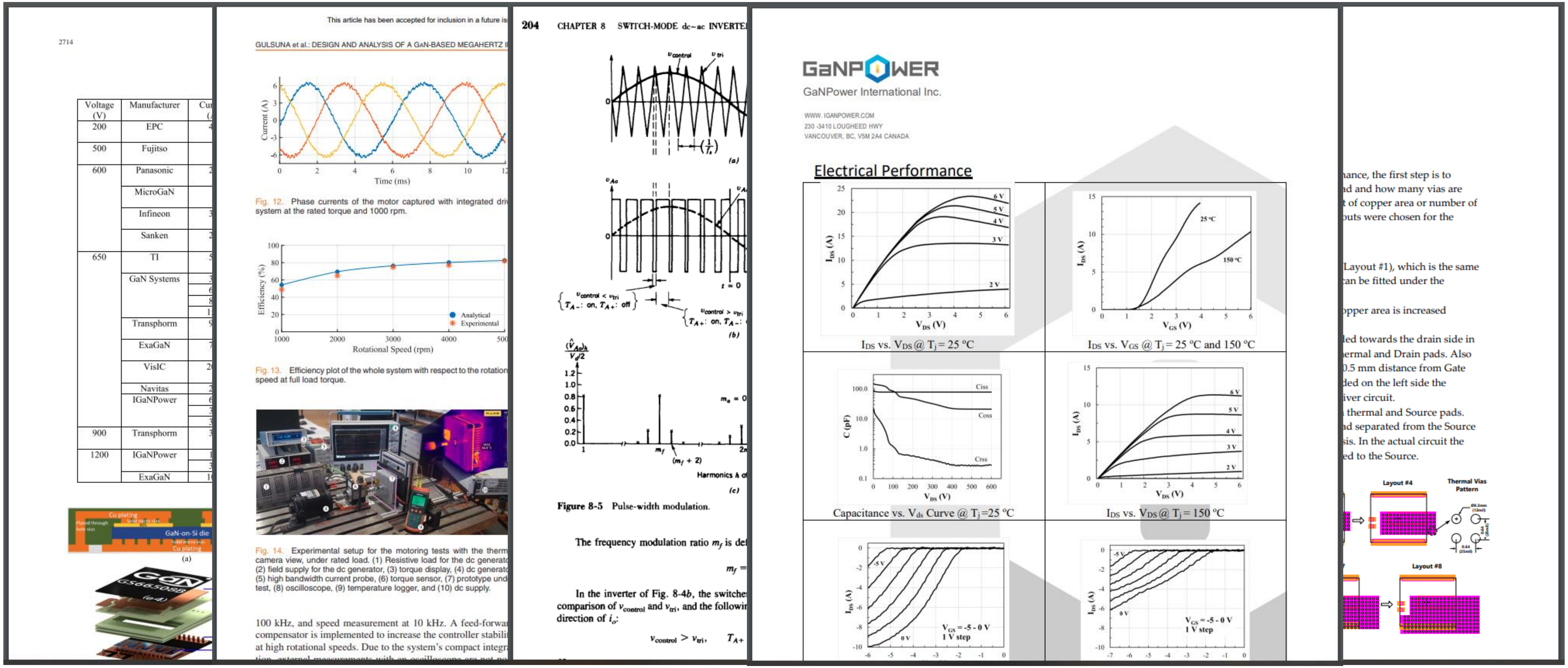
# Power Electronics Summer Research Internship

University of Toronto

Laboratory for Advanced Power Conversion and Systems Analysis

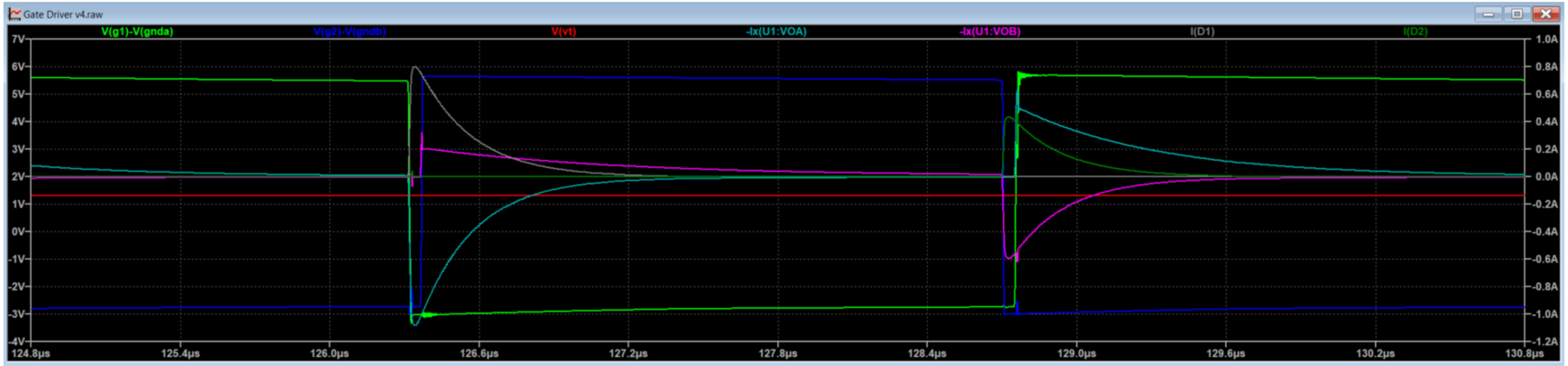
*Note: due to IP constraints, some images are blurred out and/or are not representative of the final design*

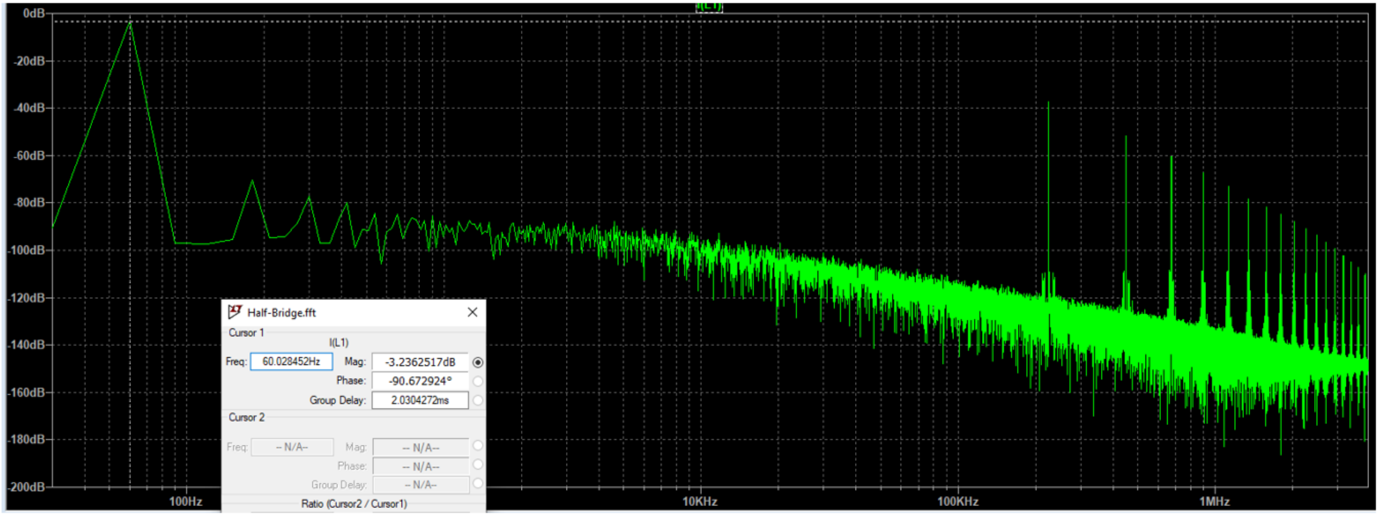
# Literature Reviews, Research Papers, Textbooks, Application Notes, Datasheets



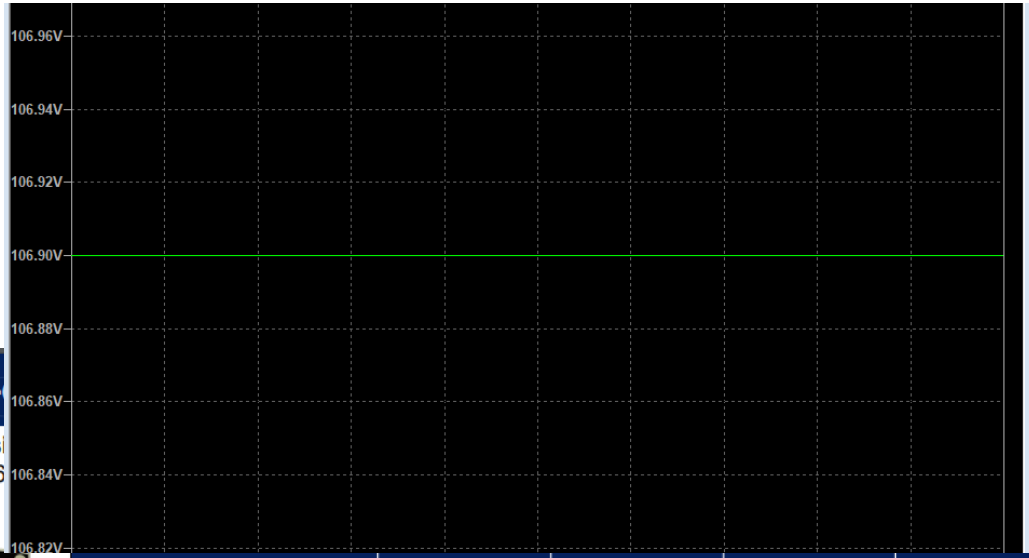
# Spice Simulation: GaN switches & gate driver

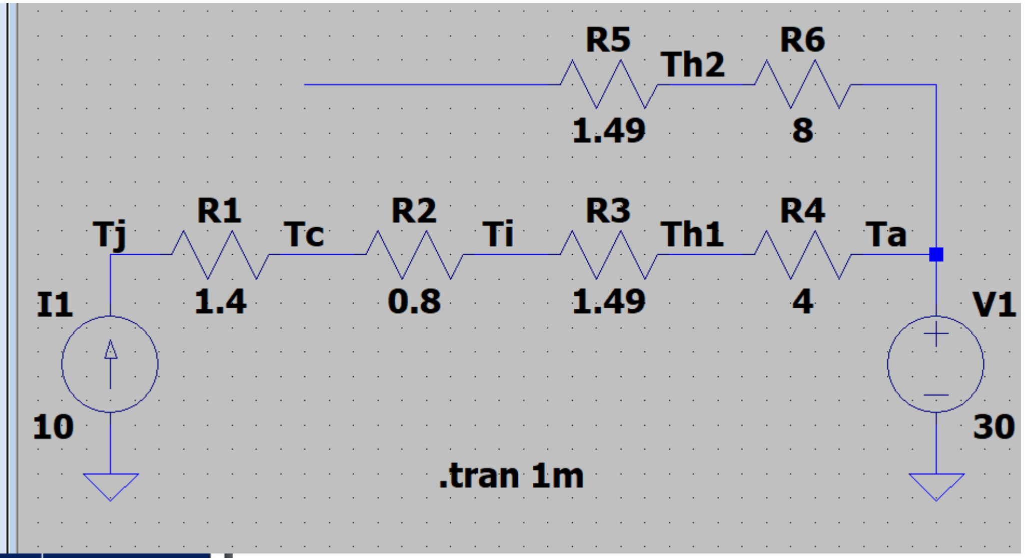
LTspice®

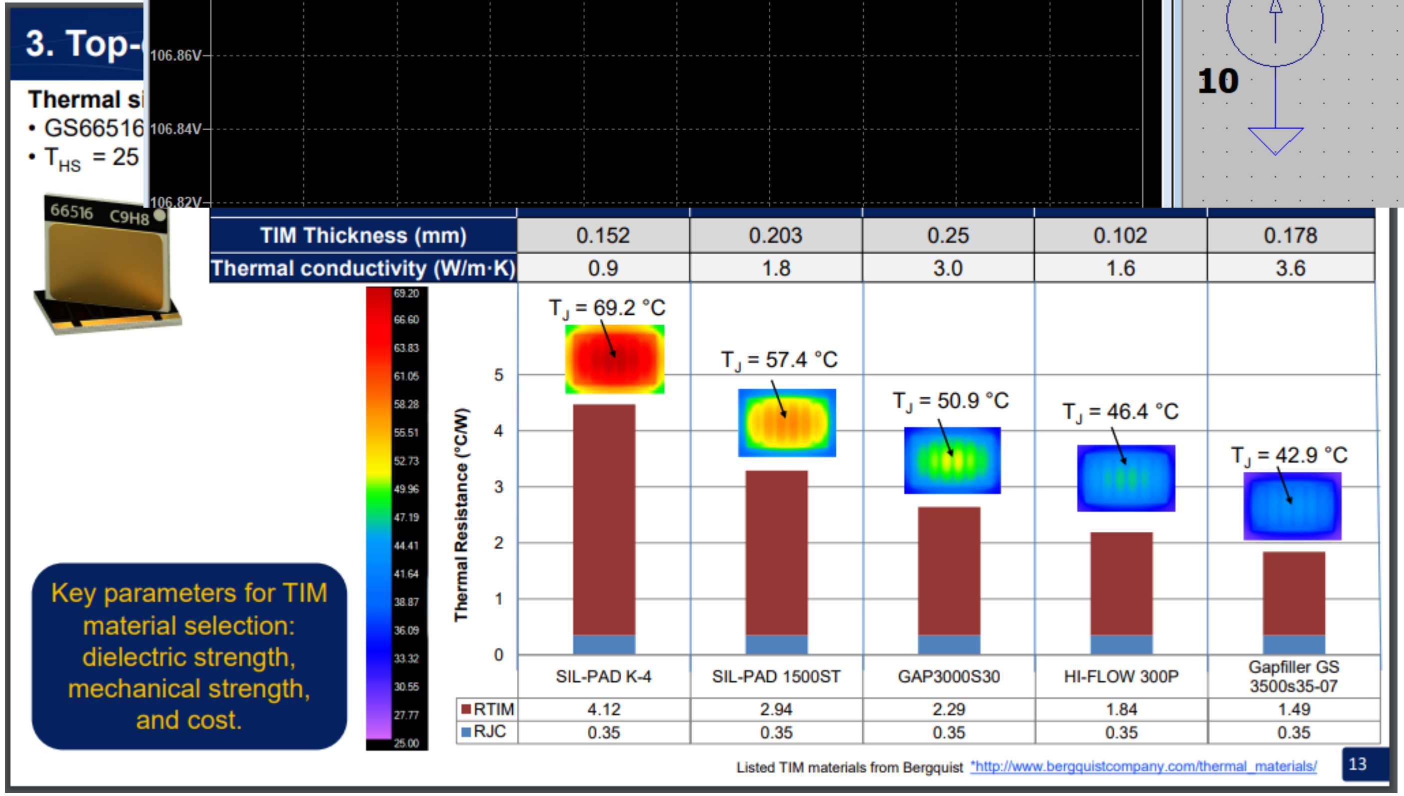


# Thermal Design and Analysis

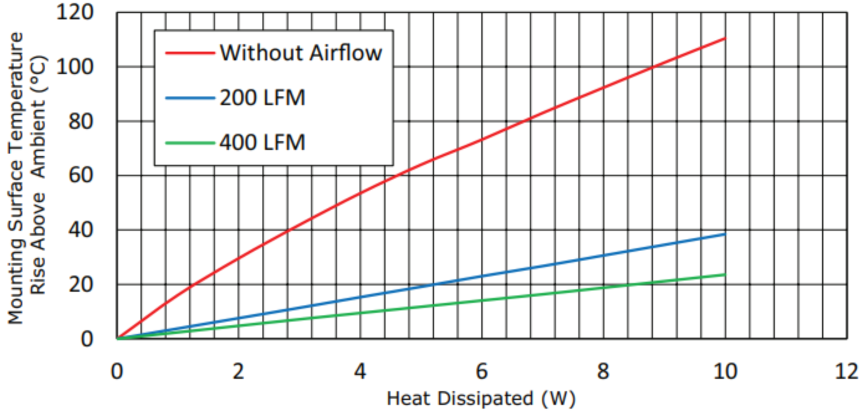



| TIM Thickness (mm) | 0.152 | 0.203 | 0.25 | 0.102 | 0.178 |
|---|---|---|---|---|---|
| Thermal conductivity (W/m·K) | 0.9 | 1.8 | 3.0 | 1.6 | 3.6 |
| | SIL-PAD K-4 | SIL-PAD 1500ST | GAP3000S30 | HI-FLOW 300P | Gapfiller GS 3500s35-07 |
| RTIM | 4.12 | 2.94 | 2.29 | 1.84 | 1.49 |
| RJC | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |

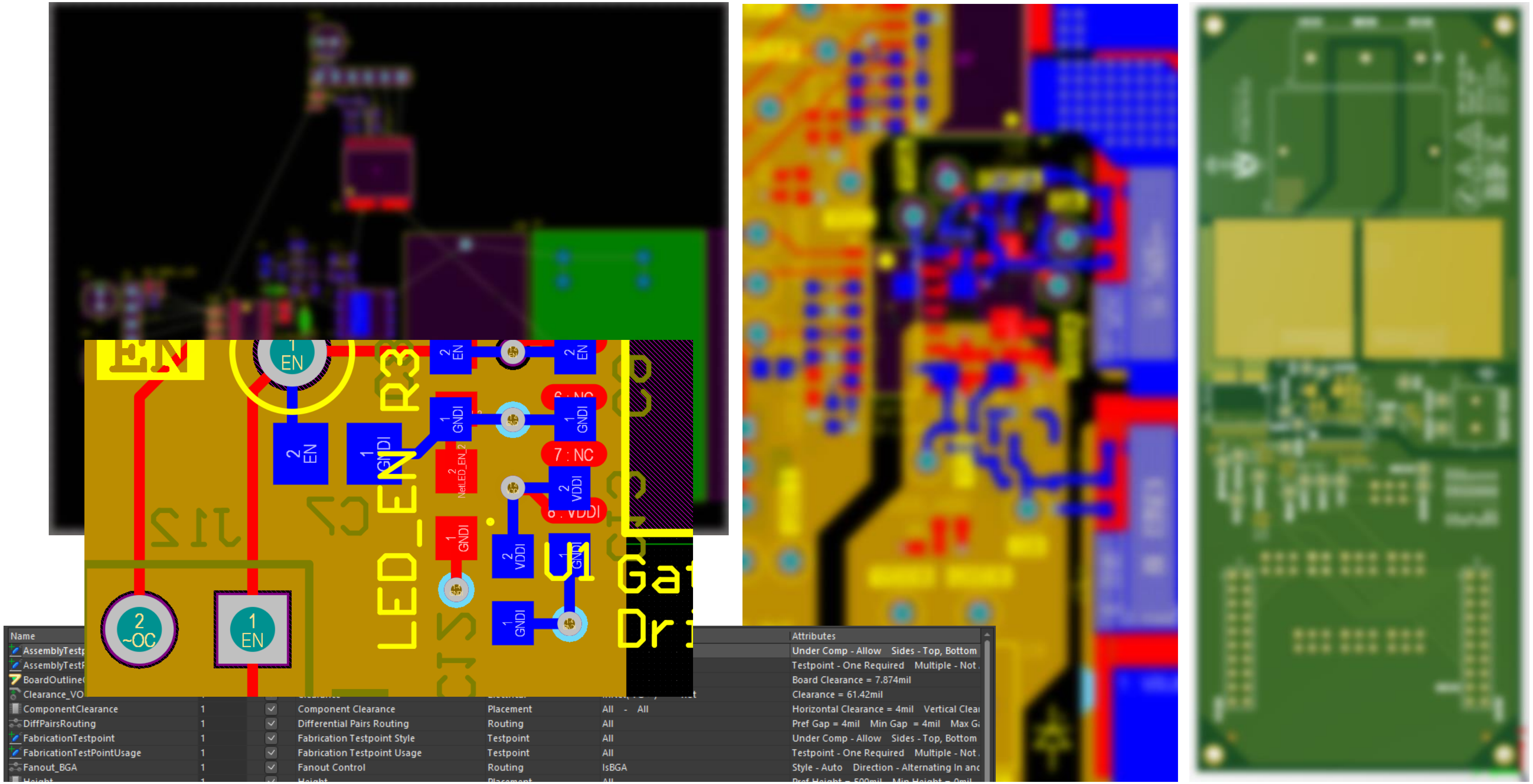
Listed TIM materials from Bergquist *http://www.bergquistcompany.com/thermal_materials/



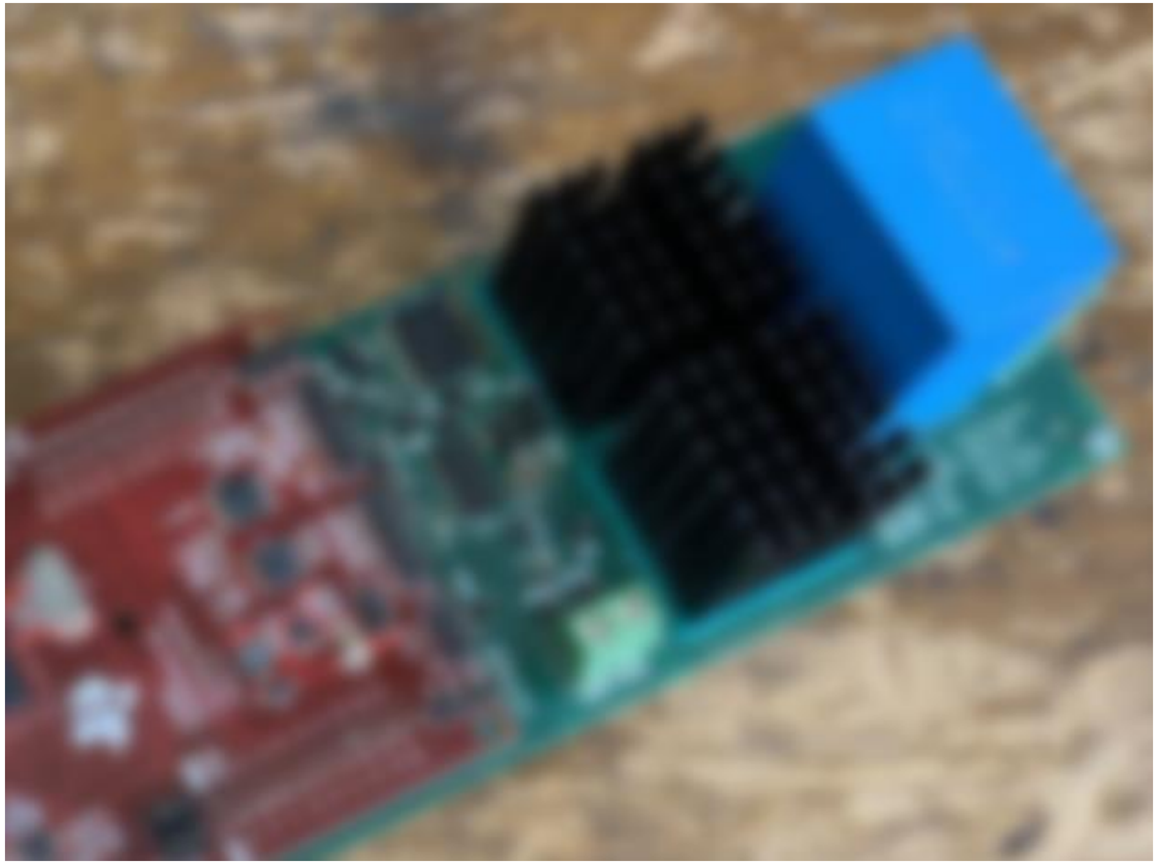
# Schematic Capture, BOM

Altium Designer

# PCB Layout and Routing

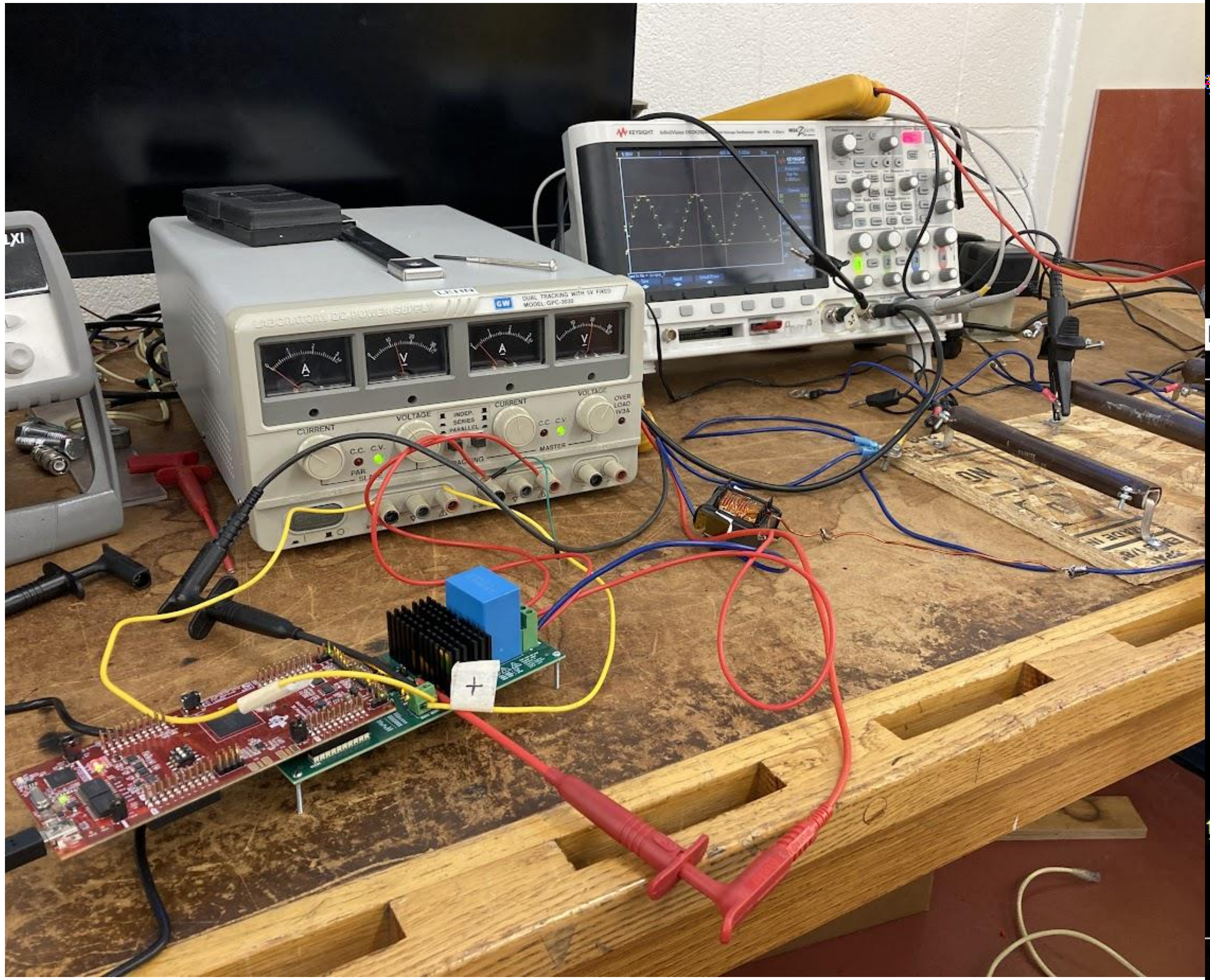


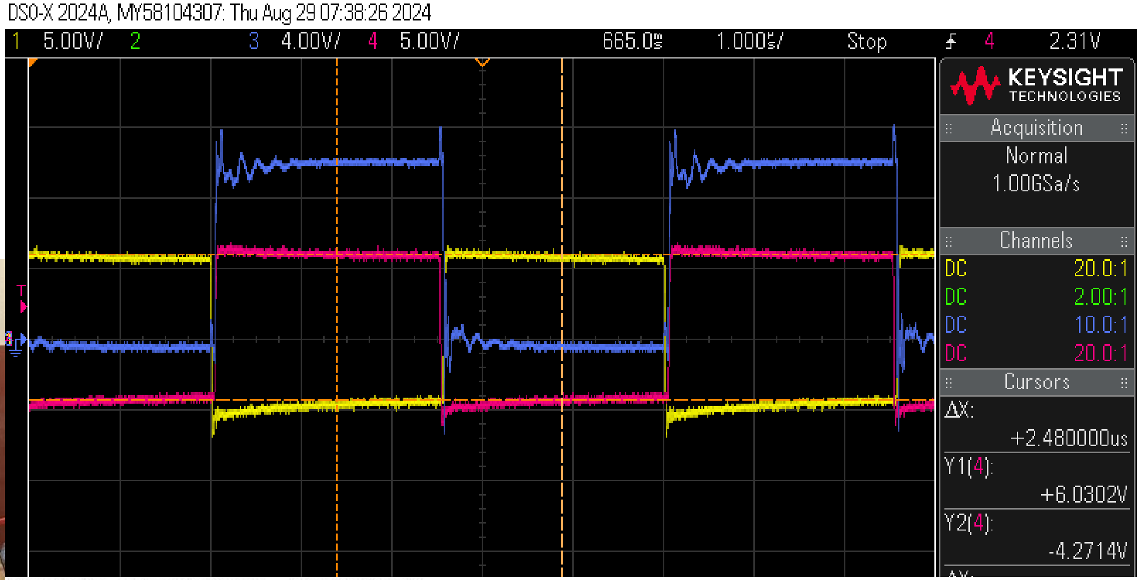
# Fabrication and Assembly

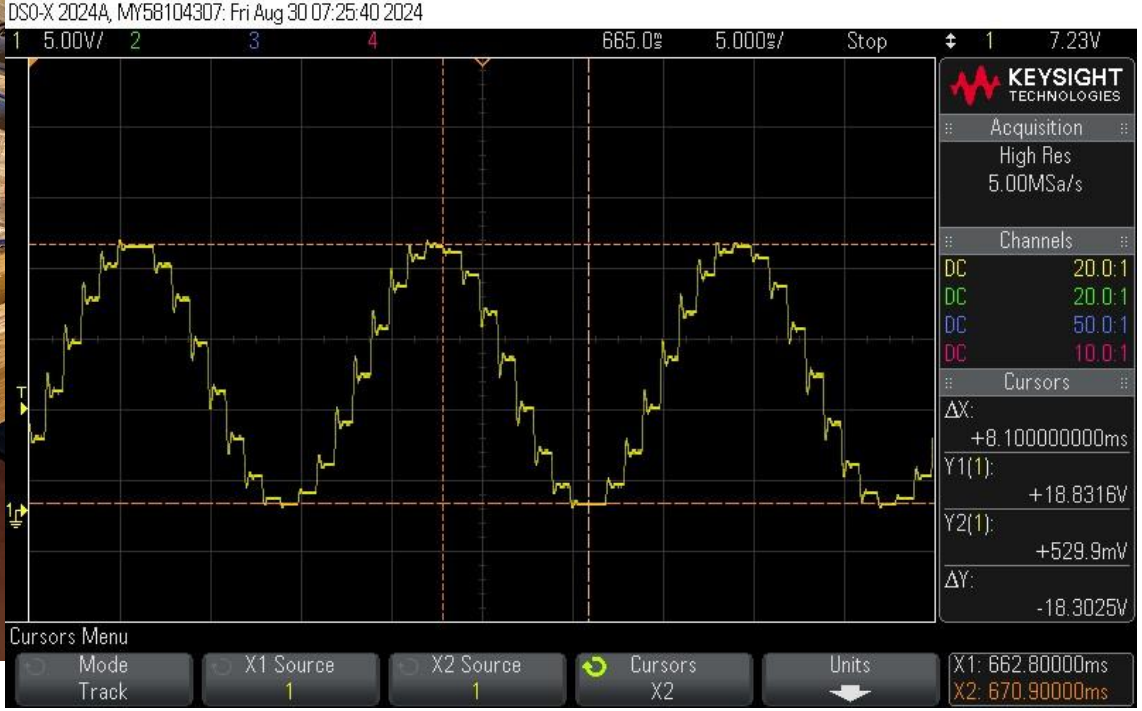


# Microcontroller Programming

# Lab Testing




DSO-X 2024A, MY58104307: Thu Aug 29 07:38:26 2024
1 5.00V/ 2 3 4.00V/ 4 5.00V/ 665.0s 1.000s/ Stop 4 2.31V
KEYSIGHT TECHNOLOGIES
Acquisition
Normal
1.00GSa/s
Channels
DC 20.0:1
DC 2.00:1
DC 10.0:1
DC 20.0:1
Cursors
ΔX:
+2.480000us
Y1(4):
+6.0302V
Y2(4):
-4.2714V


DSO-X 2024A, MY58104307: Fri Aug 30 07:25:40 2024
1 5.00V/ 2 3 4 665.0s 5.000s/ Stop 1 7.23V
KEYSIGHT TECHNOLOGIES
Acquisition
High Res
5.00MSa/s
Channels
DC 20.0:1
DC 20.0:1
DC 50.0:1
DC 10.0:1
Cursors
ΔX:
+8.100000000ms
Y1(1):
+18.8316V
Y2(1):
+529.9mV
ΔY:
-18.3025V
Cursors Menu
Mode
Track
X1 Source
1
X2 Source
1
Cursors
X2
Units
X1: 662.80000ms
X2: 670.90000ms