ELECOMP CAPSTONE SYMPOSIUM
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THE UNIVERSITY OF RHODE ISLAND

THINK BIG WE DO℠

VICOR

Probe Interface Hardware Checker

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Project Motivation

We would like to develop custom Test Hardware Checkers to better support internal and off-site testing. The Hardware Checkers would also help to reduce test development time. The product engineering department has created a new test method for verifying probe card hardware called, “the hardware checker.” The hardware checker verifies all passive or active components on the probe card before it is used to test production material. The hardware checker uses the test system and test program paired with a Resistor Ring. The resistor ring provides electrical paths from pins on the Probe test fixture to ground. These electrical paths are comprised of specifically designed resistor values. The resistor ring attaches to the circular grouped pins on the top of the probe card. By terminating the probe card outputs with the resistor ring, we can verify the probe card is built correctly

Anticipated Best Outcome

The anticipated best outcome is:

- create multiple hardware checkers that will be able to rigorously test each of their intended probe cards in order to confirm hardware functionality and completeness.
- be able to fully understand each line of code and how they function
- Fully learn the eagle test systems program. So when writing code, we are able to utilize the tools that are involved to ensure our code is correct when writing it

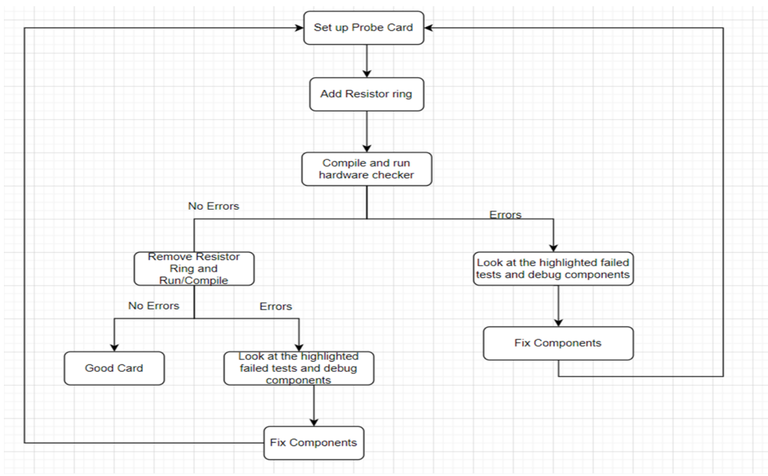
Key Accomplishments

Contract tracing of P012, P014, P052, P069 hardware checker: Used contract tracing referencing the schematic to test paths of various pinouts to read current, apu’s, and voltages. This was useful to verify all the components on the paths were verified on the pcb to ensure it functioned properly. The schematic contained numerous pages correlating to each other. It’s separated by the main page, timing page, and driver page. The main page refers the visible part of the pcb where the pinouts are visible. With the timing page it typically has a TMU A and TMU B, it often refers to the paths taken by certain pins and relates to the main page. Lastly the driver page to ensure that both the high and low sides of the drivers are working appropriately.

Software coding of P012, P052, P069 hardware checker: With the use of schematics and testing paths code was created for certain hardware checkers. The code is used for certain probe cards assigned to verify the schematic is viable and correctly operating. With the P012 the first code was created for the “BUMP” system. However starting with the P052 and P069 code was created from scratch with each probe card distributed between designers. With the creation of the code came up subsidiary support code or rules in terms of the PDS files and resistor rings.

Flowchart for Hardware Checkers

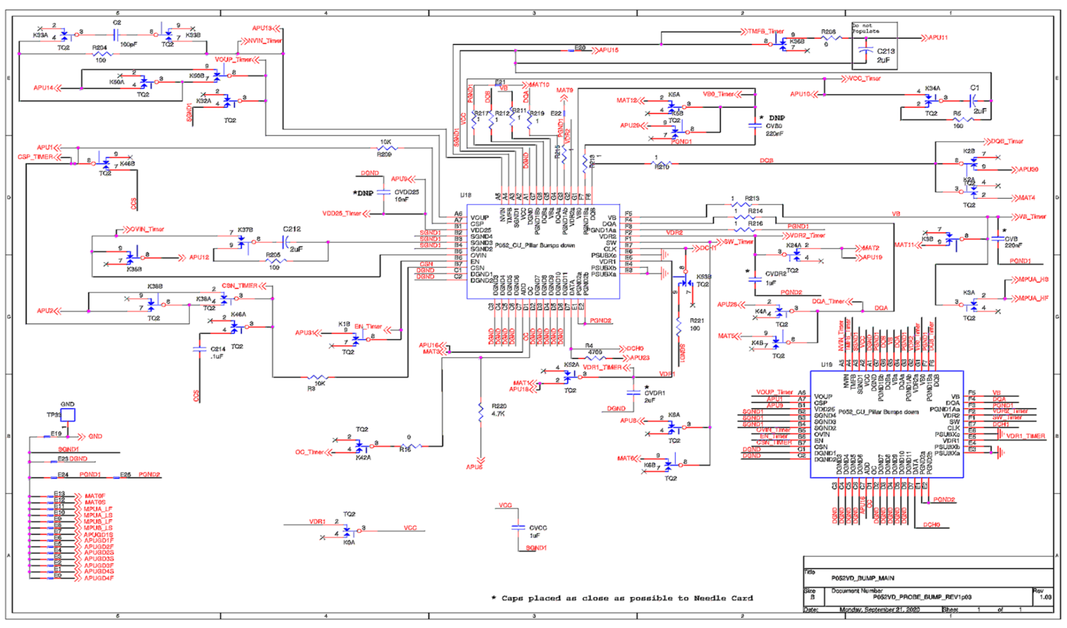
Hardware testing of P012: Worked with operating systems in the testing room. Used probers to assemble and disassemble various connected needed to be plugged into probe cards to ensure the correct voltages is distributed to the correct port. Live testing of P012 using the probers and resistor rings. In the beginning the test is ran through the probe card using the P012 code to ensure all systems are operational. After the resistor ring is added to reduce any errors of resistance values in later test. Debugging took place using the ets raid tool when problems arose.



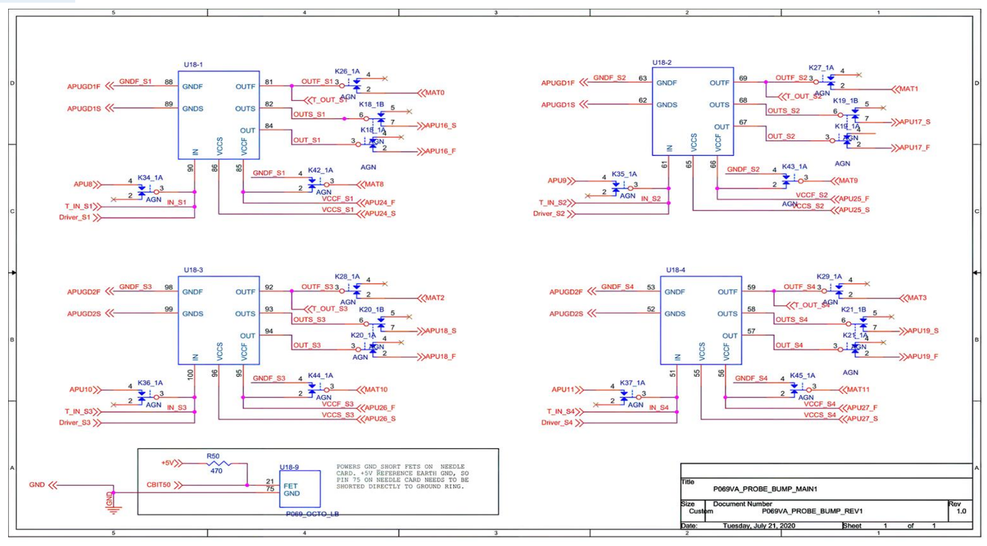
Flowchart for Hardware Checkers

```
//OC test

   apuset( GP_OC , APU_FV, 4.7, APU_10V, APU_10MA, PIN_TO_VI );
   lwait( 1000 );

   APUOC=apumi( GP_OC, 10, 10 ); // expect 1000uA
   APUOC *=1e3;

   apuset( GP_OC , APU_VIOFF, 4.7, APU_10V, APU_10MA, PIN_TO_VI );
   lwait( 1000 );
```

Test code for the P052



P052 Main Page



P069 Main Page

Implications for Company & Economic Impact

The best outcome for the company is that we complete numerous hardware checkers. With our help to complete as many as possible it’ll help the company focus on higher priority projects. The quicker a probe card can be debugged and approved, the faster the company can move onto the next project. This would have a good economic impact because due to the chip shortage and VICOR being one of the world’s best power supply companies, it is essential the company directs their focus on other tasks while we work on the lower priority projects that need to be done.

Remaining Technical Challenges

The remaining technical challenges for our team is to create more hardware checkers that are more efficient and professional. With more knowledge and practice we are anticipating to produce more logical and organized code, increase our knowledge of schematics, and greater comprehension of testing hardware. First off starting with creating more logical and organized code. This is a technical challenge since hardware checkers all differ and different code is required. However, the challenge is to format the code similar to the ones already written so it’s viable for any designer to understand.

Next is knowledge of schematics and how to approach them. With a better understanding of pathways creating code for the test will be more efficient. Lastly use of the probers in the testing room as well as ets raid to ensure that our code is functioning properly with the hardware. This is important skill to acquire since the testing room is often occupied heavily by engineers for various products. Time is essential while testing, the faster the set up and familiarity with the programs, and probers the more productive and effective our team can develop of additional hardware checkers. The reason behind this is with the tester we can see certain problematic areas. The places of error vastly decreases when using the tester since it can tell us whether there’s a problem with the code or the hardware itself. If any alarms are given than the error is with the code however if certain voltages and reading are off, we could use volt meters to view the volts being held or produced by certain resistors, capacitors, LEDs, etc. If there is any error, we would have to replace the component to certify that it’ll be operating correctly.

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