

Mounting Protocol Development for Photovoltaic Cells for CubeSat on PCBs

Student: Alessandro Console Mentor: Dr. Adam Huang

Microelectronics

Undergraduate School / Major: Harding University / Mechanical Engineering

Background/Relevance

- CubeSat and nano scale satellite power supply.
- Photovoltaic technology with single or triple junction cells and made with silicon or GaAs materials.

Innovation

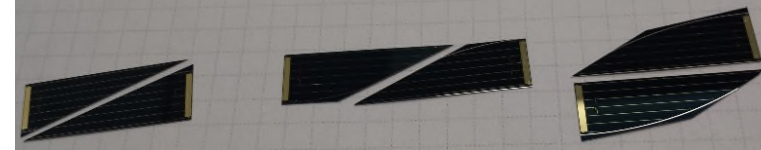
- Reduced cost of solar cells and availability of economical space grade photovoltaic cells.
- Standard design of nano scale satellites encouraged for universities and small companies to utilize for space scientific research.



Original TrisolX cell shape

Approach

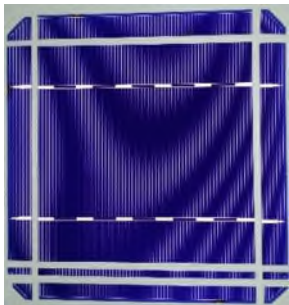
- Cut TrisolX solar cells.
- Cut MISOL 5x5 Mono Solar Cells.
- Orient cells in a manner to be most efficient for a limited surface area.
- Mount cells on Printed Circuit Boards to test the amount of space needed making sure that the cells don't interfere with one another.
- Test voltage supply of the cells.
- Test cells connection with voltage step up circuit.



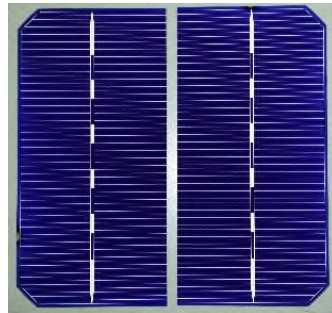
TrisolX cells cut in 3 different shapes

Key Results

- Cells function efficiently after cutting.
- Reflow Soldering is a functioning method to mount TrisolX cells on PCBs.
- The voltage step up circuit is inconclusive.



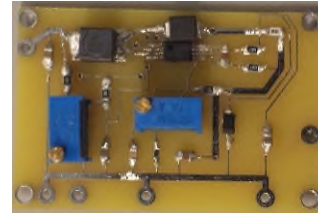
MISOL cells cut to form a 4"x4" cell



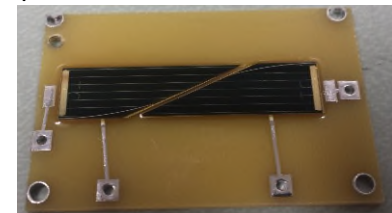
Vertical cut with final half cells

Conclusions

- Different cells shape can be chosen depending on the availability of area on the CubeSat.
- Big solar cells will most likely be used at the sides of the CubeSat while the TrisolX cells will occupy the ends of the satellite.
- More research is needed for voltage step up circuit.



Voltage bump up circuit



Mounted TrisolX cells

Graduate: Josh Pennington, Morgan Roddy, John Lee

Research Funded by National Science Foundation REU Grant # EEC-1359306

Summer 2015