

Team 70820A



PARTS ANALYZED

| Capacitors | : | 13 |
|--------------|---|----|
| Transistors | : | 4 |
| Transformers | : | 1 |
| Resistors | : | 1 |
| Fuses | : | 1 |
| Chips | : | 7 |
| Inductors | : | 4 |
| Rectifiers | : | 10 |

Mitsubishi HI-POT 0627T B-5 Transformer



Metallized Polypropylene Film Capacitor



Jamicon TK105 1uF Capacitor

Final Summary Report

Electronics Online Challenge Sponsored by Texas Instruments

Introduction

The electronic device that I selected to take apart is a TiVo Series 2 DVR because I use it everyday. I originally wanted to take apart a television, but I did not have an extra. A TiVo is a computer-like device that has digital video recording (DVR) abilities. It allows people to record shows from cable TV.

Summary of Parts



TiVo Power Supply



TiVo Power Supply Desoldered



LTEC LZG105 470 uF Aluminum Electrolytic Capacitor



LTEC LZG105 2200uF Aluminum Electrolytic Capacitor



SEK105 47uF Capacitor



Acbel 330uF Capacitor



Nichicon AD423 68uF Aluminum Electrolytic Capacitor



Littlefuse 392 Series Time-Lag T3 15A Fuse

TOOLS

- Hako Soldering Iron
- Wiha Screwdriver
- Weller 7874B Desoldering Pump
- Craftsman Pliers
- Light Microscope
- Magnifying Glass
- Computer/Internet



TiVo Before I Started

Summary of Parts



Plastic Silicon Rectifier

3.3nF Capacitor

.42 Ohm Resistor



KA 431AZ 313 Transistor

CD681M 680pF Capacitor

Heat Sink



2.2nF Capacitor



Fairchild LM317LZ Transistor



Inductor Coil



Desoldering TiVo Power Supply



Using Microscope to Find Part Numbers

TiVo Digital Video Board



- BCM7040 MPEG2 Digital Video/Audio Encoder Chip
- Broadcom Single-Chip Satellite Set-Top Box Decoder Chip
- 😑 Nanya 256 MB SDRAM
- Micronas AVF4913A Chip
- ISSI Synchrnous Dynamic RAM Chip
- Atmel 8-Bit Microcontroller Chip
- SST 37YF010 Many-Time Programmable Flash Chip

Research Findings

The part that appears with the most frequency are the capacitors and resistors. A capacitor stores electricity and can also be used to filter. There are also multiple transistors, which are switches and can be used to amplify signals. The TiVo has a transformer that converts one voltage to another as well as a fuse that prevents short circuits. The rectifiers convert AC currents to DC currents. The board also has many chips used for encoding video, encrypting/decrypting video as well as for storing data while it's being processed.

Conclusion

This challenge was much harder than I expected. My goal was to take apart the TiVo and figure out what all the parts do. To do this, I first had to desolder the components from the circuit boards. The TiVo has two printable circuit boards (PCBs), one for the power supply and the other for processing data. Components attach to the boards by sitting in tiny holes and getting soldered on the other side. I ran into a problem, though, removing the chips because after desoldering a side, it would cool before I was able to finish with the other three sides, making the chips hard to remove. The second and most difficult step was reading the labels on the parts because the numbers and letters were tiny and hard to decipher. I ended up using a compound light microscope to see them. Once I had the identifying information for each of the parts, the final step was to look them up online. This process was tedious and took weeks to complete, but it helped me learn about different electrical components. While searching for each part number online, I discovered that each part has a unique combination of numbers, letters, and/or colors to distinguish them from other parts. I found a chart that listed the labels on the PCB and shows how each label corresponds with a type of part (C represents a capacitor and R represents a resistor).

I never imagined that there was such a complex naming system for parts, and I enjoyed getting to desolder and use a microscope to figure it out. It was a great learning experience. Learning how to remove, identify, and replace an electrical component will help me in the future when I need to fix devices on my own so that I don't have to get a brand new device just because one part breaks.