Our team chose to take apart and document the TI-85 Calculator. We chose this because graphing calculators are an integral part of our daily lives, and we should know how they function.

Within the calculator, we found: a T6A43, two T6A39, T6A40, and LH52250AN-90L ICs, 50 button inputs, 4 AAAs, a Li-Ion Battery, and an LCD. In addition, we found a IC manufactured by Texas Instruments: LH53IGIN. However, considering this calculator is made by Texas Instruments, they probably played a role in the development of these ICs.

The LH52250AN-90L IC, produced by Sharp, is a module of SRAM, containing 32k bytes. 28k of those bytes are user-accessible. As SRAM cannot store data without power, the Li-Ion battery provides power to save the programs to the SRAM module while the batteries are being changed. This RAM functions to store variables, user written programs, and intermediate results for the overall system.

The LH531G1N IC, produced by Texas Instruments, is a MROM module containing 128k bytes. Since ROM does not erase when the power is turned off, it is used to store the operating system of the TI-85. ROM is only able to be programmed onto the chip once, and thus, the operating system cannot be changed.

The T6A43 IC used in the TI-85 is a combination of the Z80 microprocessor and an Application Specific Integrated Circuit. This IC, effectively the CPU of the TI-85, runs at a frequency of 6 MHz, and has a 16 bit address bus, which allows for access to memory locations. The function of this IC is to execute the program stored in memory locations of SRAM and the MROM, in accordance with the user’s inputs.

The LCD is comprised of two substrates, with a layer of liquid crystals in-between them. On the outside of each substrate, is a layer of polarizing film. The inside of one substrate contains rows, and the other, columns, of a conductive and transparent material – presumably Indium-Tin Oxide. Each of these columns is attached to an output of one of the two T6A39 ICs. There are 128 columns total, and 80 outputs in each of the ICs. Similarly, there are 64 rows, each attached to an output of the T6A40 IC, which contains 68 outputs. The CPU sends instructions to these ICs, and these send corresponding voltages to the LCD. When electricity is sent through the row and column of a particular pixel, the voltage forces the liquid crystal to untwist, and let light through, in order to display a visual representation of what the system is doing.

Throughout this whole experience, we have learned a great deal. We learned how to search for relevant datasheets, and furthermore, how to read them. We also learned how to analyze a given piece of circuitry, and to use our resources to do so. Lastly, we did what we set out to do: figure out how graphing calculators do what they do, so that we can use them in our daily lives.

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