Flash Memory

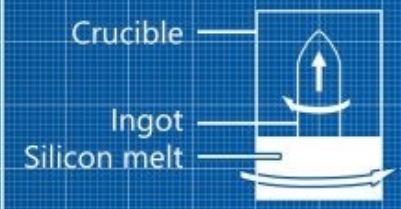
pi3g

Silicon

14 28.086
Si
Silicon

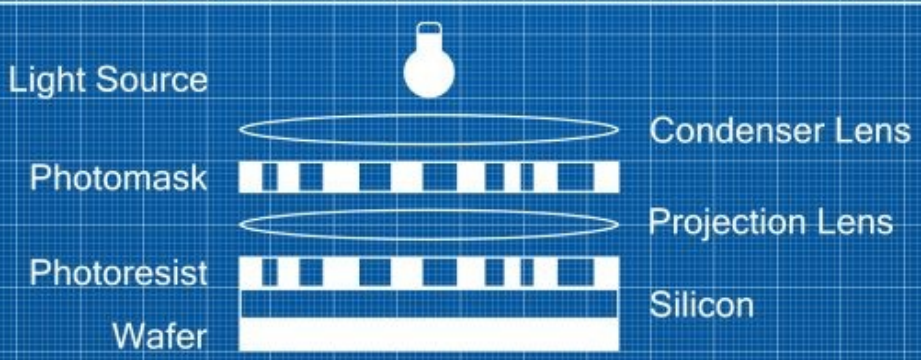
- Metalloid
- hard, brittle, crystalline
- blue-grey metallic

Czochralski method



- Melt Silicon
- Indroduce seed crystal
- Counterrotate crystal and crucible
- Pull out crystal slowly

Photolitography



Flash memory cell

Write

- Trap electrons in Floating Gate > Logic 0
- Release electrons from FG > Logic 1

Read

- e- trapped in FG > no current flows > Logic 0
- No e- trapped > current flows > Logic 1

Most everybody uses flash media storage at some point in their life, whether for cameras, backups, or even running entire applications. They appear as such simple devices; just plug it in the proper slot and the computer knows what to do. But, as with most things in life, there's a vastly complex underpinning to their creation and operation.

This infographic provides an interesting look into the life of a flash memory device. It provides an organized yet brief look at what the physical makeup is and how it works.

Audience and Purpose

The infographic is aimed at Raspberry Pi enthusiasts and advanced computer users (AKA 'geeks') who are interested in understanding how flash memory works. There are four reasons for thinking this: 1) More than likely, average computer users who 'just want the damn thing to work' are not seeking out this information. 2) The terminology used is not common knowledge. While most people may know that computer chips are made with silicon, the titles "Czochralski method" and "lithography" are likely foreign to most. Even if the reader does not possess knowledge of all the terms, a geek is more likely to pay attention to this and seek out further explanation. 3) The "pi3g" in the upper-right corner is a reference to the company that devised this graphic. They develop various products for Raspberry Pi's. 4) The coloring and graph paper-like background gives a feel of "This is science!" to the reader, indicating that it is not aimed at those not interested in the depths of computer science.

The infographic offers a brief explanation of four different pieces of the workings of flash memory as shown by the four distinct rectangles. With some required background knowledge, the titles give us clues about what each section is communicating; the first rectangle contains the main element used in producing microchips, the second box shows a refinement process, the third overviews the process of creating a chip, and the fourth displays how memory works at the cellular level.

Main Components and Background Knowledge

Despite using only two colors - blue and white - the visuals presented are quite 'flashy'. White is used to present information to the viewer and give texture to the background while blue is used as a muted background color to help the information pop out and look 'cool' to the viewer. As mentioned above, there are four clearly divided sections each containing a title, accompanying image, and minimal text. The titles outline the purpose for each section while the images illustrate the details of the section with accompanying text to clarify what each image means. The first image we see is that of the element silicon as it would appear in the periodic table of elements and a list of some of its properties. Next, there is an image we can assume, due to the title, is of the Czochralski method of turning silicon into something useful, with text indicating the steps involved. Then an illustration of photolithography with text indicating what each layer of the image represents. Lastly, we see a diagram of what is happening inside a single memory cell with a description of the process of writing and reading from it. These are all presented in a sequential order, from top to bottom, as they would happen in the life of a flash memory drive.

If you're not a computer scientist, it would be obvious that much background knowledge is needed to piece this infographic together. Even the diagram itself does not contain all the necessary information to know everything it is trying to say, which is further elaborated upon on the website where it is found. What is flash memory? What is a seed crystal? A crucible? Wafers? Floating gate? I certainly can't remember the last time I mentioned a seed crystal to someone. Even further removed from that, we can gather that one needs to know to read from top to bottom and English in general, let alone the scientific jargon.

Layout and Composition

The whole infographic has a margin at all edges and a global, vertical, rounded rectangle containing the entirety. At the top, we see a large title on a solid blue background then a line separating it from the rest. There are then four more distinct, smaller rectangles with slightly rounded corners housing each separate idea pertaining to the creation of flash memory. This clearly separates all the data into digestible chunks which aids in

the conveying the author's purpose by letting us consider each idea – silicon, the Czochralski method, lithography, and reading/writing memory – on its own. The author shows restraint in only presenting what needs to be shown. There are no colorful extras or distracting images in the background other than the background itself. There is also heavy use of margins on all edges of each element to further segment the data and promote readability.

The author also is very sparing with words and uses text formatting to help readability. There are no complete sentences, interestingly, instead shortened phrases or words encapsulating the idea. Titles tend to have larger text size while bullet points are usually smaller. The labels for the image in "Czochralski method" are even smaller. There is some inconsistency though, an example being that the "Silicon" title appears bolder than the titles of the other three sections.

Rhetorical Appeals

Being that we are dealing with computer science, there is heavy appeal towards logos. Computers (as far as we know) deal purely in logic. Even in the process of manufacturing, one step must lead to another in a robotic fashion in order to make a quality product, as shown in this graph. We cannot perform lithography until we have used the Czochralski method of refining silicon and we cannot read or write from memory until a card has been fully manufactured. The author shows us this by presenting the information in this logical order. I am convinced by this appeal; based on my knowledge, I do not see anything illogical.

The author also hopes to appeal to us through their ethos. By using proper terminology, we are more likely to believe that they know enough about the topic to explain it to us. By presenting the associated diagrams, we further believe that they have seen or at least studied the process of manufacturing enough to relay correct information. The author unfortunately loses some of my faith in their ethos due to one spelling mistake and two instances of inconsistent capitalization in the "Silicon" section. This could indicate that the author rushed the production of the infographic, does not care about the proper use of English, or did not edit the text or even the whole graphic. In the latter case, that could even mean the author presents incorrect information because they failed to examine what they put in. Still, I am content to believe that the information itself is correct and feel it is unlikely that the author carelessly posted something false.

Conclusion

I feel there are many great things this infographic does. The use of margins and containing data inside separated rectangles helps immensely with readability and separating ideas, and clearly outlines what it intends to communicate. The simplicity of the presentation further hones in on the information itself; by using a simple layout with no extraneous information or images, we can focus solely on what the graphic is trying to convey rather than be distracted by less relevant details in the background. The use of bold text, diminishing text size, and lines is also helpful. Larger, bold text stands clearly as a main title, then smaller bold text can be used as sub-titles for each section, and even smaller text used for the details of those sections.

On its own, I do not think the author conveys enough to teach something useful. I feel this infographic serves more as a push to seek out more information about the processes and terms that it presents. In fact, the web page this is found on breaks down and elaborates each section. This is fine in my opinion, for anyone who wants to learn will likely do so and it would be difficult to condense something so complex into a one-page graphic. If I had to change one thing though, it would be graph-like background intruding upon the information. I do like the look of it but I feel it is distracting and could have been left in the margins or perhaps used a different color to make it hide behind the text more.