

What did Apple do for the MacBook 12 'to consume as little power as possible?

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Apple's newly released 12 "MacBook has absolute thinness, Retina display, but retains an impressive battery life of about 9 hours. This 9-hour figure is nearly 2 hours lower than the MacBook Pro 13. "Early in 2015 but remember that the battery capacity on the MacBook 12" is nearly half lower than the MacBook Pro 13 "(39.7Wh compared to 74.9Wh). It is even lower than the 54Wh on the MacBook Air 13 "which used for 12 hours. So what did Apple do for the MacBook 12" to consume as little power as possible?

To achieve that achievement, Apple not only crams maximum battery capacity into the space inside the device, it also incorporates many factors such as the new Retina screen, RAM and super-energy-saving processor chip to help the machine consume less electricity.

New technology Retina

Previously, when MacBook Air did not have a Retina screen, many reasons were mentioned, two of which were technologies that did not allow Apple to integrate the Retina panel into a thin machine and it would significantly reduce the time spent. Use the device's battery. The MacBook 12 "has a significantly smaller screen size than the MacBook Pro 13" and the battery capacity is less than half the size (39.7Wh compared to 74.9Wh) but the time used for a single charge remains Very impressive amount of **9 hours** . The power that a panel Retina has with millions of pixels needed to operate is much larger than that of a normal screen, and the very high pixel density / inch makes the backlight more difficult to illuminate.



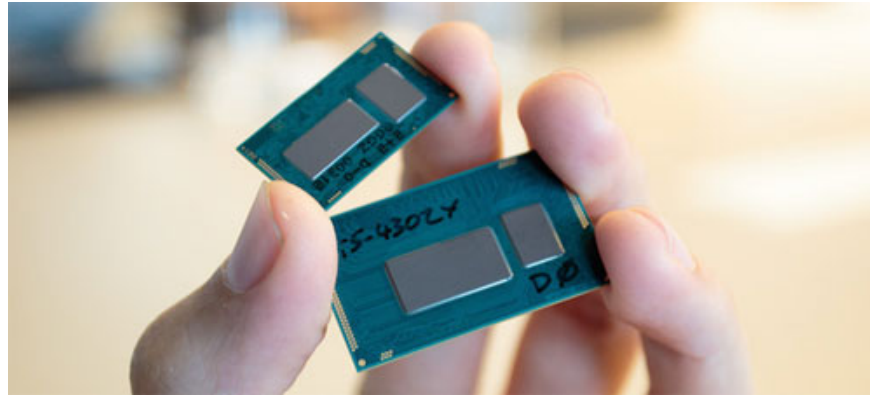
Usually to do so Apple or manufacturers must need higher capacity, single-occupancy batteries like the iPad 3 or iPad mini 2, both thicker than the previous generation to support the Retina display. The new MacBook does not, it is thinner than the MacBook Air. In TFT-LCD monitors, part of each pixel is covered by transistors that control sub-pixels of blue, green and red. Depending on the design and each panel type, the area that is not covered by the transistor is small or large, usually half the area of a pixel. When this unoccupied area is smaller, the backlight will need more energy to illuminate, resulting in it consuming more power. Fortunately, there is a way to increase the area for this part of the transistor.

One of the solutions used is to change materials to make transistors. The LTPS (*low-temperature Polysilicon*) panels - used by Apple on the iPhone - use smaller size transistors thanks to higher *electron* mobility (*electrons*), thus increases the area of the transistors not covered by each pixel.

Another solution is to redesign every pixel, which seems to be the way Apple applies on the newly-released MacBook 12. Apple doesn't say much about the technology but some evidence suggests that they stack up layers each other, thus increasing the area for the transistor-free part, in the past, an Apple patent that explained the technique of splitting transistor ports into two parts and piling them up to increase the area of the transistor. However, it is unknown whether Apple will use this technique or not, only to know the result that Apple achieved is to significantly increase the area for the part that does not contain the transistor, so that the backlight works more efficiently, more efficiently. **30%** less energy used compared to other laptops, so a power saving issue for MacBook with m Retina display has been resolved.

Broadwell Core-M processor chip

After the Retina ultra-high resolution screen, the processor chip is the next factor consuming a lot of power of the device. Apple uses the latest **Broadwell Core-M** processor from Intel, which is a super-energy-efficient chip with two processor cores. Broadwell is in the 'tick' phase of Intel's chip development process. This phase does not have many structural changes but the most significant improvement is that the production process is reduced from **22nm** to **14nm** . The reduced size of each transistor will allow Intel to integrate more transistors into the chip, thus increasing processing performance. Data from Intel show Broadwell uses **30%** less power than the previous Haswell generation while its performance is even higher.



Broadwell Core-M is smaller

Simply using Broadwell for the MacBook 12 "is not enough, but Apple also turned to the super-energy-efficient version of the chip, which is Core-M for mobile devices. **Core-i5 CPUs** on MacBook Air have **15W** capacity while with **Core-M** on the MacBook 12 "is only **5W** , very impressive. Reducing capacity also means reducing the amount of heat that the CPU emits when operating. This is significant because Apple can confidently remove the radiator fan on the MacBook 12 ", thereby reducing a bit of power consumption by the cooling fan also need to power to run.

More efficient RAM

Apple has begun to popularize super-power **LPDDR3 RAM** memory generation on its computers. It began appearing on the MacBook Air in 2013 and the MacBook 12 "also uses this RAM technology. LPDDR3 was originally built for smartphones and tablets so it is different from DDR3L, the power-saving version of the kit. RAM for computers.

Besides requiring lower I / O voltage, LPDDR3 runs with 1.2V HSUL voltage (*lower than 1.35V SSTL on DDR3L*), LPDDR3 also has a standby mode during *stand-by* .

When operating, RAM LDDDR3 only uses about **70% of** the power compared to traditional DDR3 RAM. While in standby, that number is **10%** . If compared with DDR3L, the number of operations will be **85%** .

Other factors

In addition to the new technology Retina screen, RAM and ultra-low-power CPU, there are other factors that help the MacBook 12 "use less or use power more efficiently. The new 'ac' Wi-Fi is a wallet. For example, this 'ac' standard completes network response time faster so that the chip will switch back to power saving standby sooner, which is why smartphones consume less power when used. Wi-Fi is more than 3G or LTE.

New-style keyboards are also a factor. Apple, instead of using LED lighting for the keyboard via a light-emitting plate, equipped each key with a separate LED on the new MacBook 12 ". This allows for a more efficient energy management system.



Battery placement technology

Finally the new battery design. Using a multi-layer battery technology, Apple can cram a lot of battery capacity into the empty space inside the device. As a result, the MacBook 12 "has **35%** more battery capacity than current battery technology.

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