

Development of “VersaPro UltraLite” Featuring a Light Weight, below 1kg and a Long Battery Drive Time of 7 Hours

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Abstract

Some of the most important characteristics required for a mobile notebook PC is the “light weight” and “long battery life,” but it is technically difficult to achieve these targets simultaneously. With VersaPro UltraLite, the authors have succeeded in providing both light weight and a long battery life by adopting new technologies and thorough design measures, at the same time as greatly enhancing the security function that is critical for business users. This paper is intended to discuss the orientation of mobile notebook PCs in the Ubiquitous Age and the technological measures used in their designs.

Keywords

weight reduction, magnesium die-cast, built-up PCB, Proadlizer, power consumption reduction, security, virus

1. Introduction

“VersaPro UltraLite” (Photo 1) released in December 2005, we have attempted a thorough weight reduction. It achieved a light weight of about 996 grams (under the minimum configuration) and a long battery drive time of about 7 hours (measurement in compliance with JEITA). This product also features a major enhancement of the security measures that have become some of the most critical issues for businesses.

This paper is intended to introduce the new measures incorporated in the present developments.

2. Challenges of Weight Reduction

The new technologies adopted in a thorough pursuit of weight reduction are as follows.

(1) The Thinnest Die-Cast Magnesium Cabinet

Mobile notebook PCs marketed by PC manufacturers employ thin (0.55 to 0.6mm) magnesium die-cast materials in order to



Photo 1 External view of the VersaPro UltraLite.

reduce weight. From a very early stage of the design of the new product, we held thorough discussions with the Japanese die-cast manufacturers aimed at achieving weight reduction. Various simulations were repeated and we have succeeded in implementing a very fine thickness (0.45 to 0.55mm) that has hitherto never been achieved by any other PC manufacturer.

(2) Key Components

① LCD Module

The mount section of traditional LCD modules has been composed of a metallic frame. The new product has eliminated the use of a metallic frame, adopted a new material for the light guide plate and reduced the area of its control board, thereby achieving a weight reduction of about 30 grams compared to the previous LCD module.

② Keyboard

In general, the keyboard for notebook PCs is designed by placing the priority on reducing the thickness while maintaining a high rigidity, and metallic frames are used in order to meet the high rigidity requirement.

While our previous model reduced the weight by adopting a magnesium alloy frame featuring a low specific gravity instead of an aluminum frame, this material was considered to be disadvantageous from the viewpoint of cost. In the development of the new model, we adopted a new design for mounting the keyboard on the main body and succeeded in halving the keyboard weight, while using the same aluminum frame as for the old models. As a result, the new product has achieved a weight reduction of about 3 grams at the same time as a cost reduction of about 3 US dollars.

③ Built-up PCB

Chip packages are currently in the process of undergoing reductions in size, increase in pins of CSP and BGA, and pitch decreases.

In order to meet trends in high-density component packaging as well as to reduce the size and weight of PC boards, we have adopted the built-up PCB (2-4-2HY, L/S = 100/75) in the new product.

The built-up PCB has the following features.

- Built-up wiring layers are formed sequentially on a metallic base to form a multi-layer structure, and then the metallic base is removed by etching, in order to enable a high density to be achieved on a packaged substrate of a similar thickness to tape.
- The core layer that has hitherto been necessary for traditional PC boards is no longer necessary, making it possible to reduce the board thickness at the same time as reducing the number of layers.

④ Reduced Power Supply Circuit Size Thanks to the Proadlizer

An increase in the frequencies handled by semiconductor chips has led to increasingly complicated circuit designs. This trend has been due to the necessities of combining various types of decoupling capacitors from low-frequency ones to high-frequency ones and of adjusting the PC board wiring, etc. according to the characteristics of the different capacitors. To solve this problem, the new product adopts the “Proadlizer” decoupling device, which has been developed by the NEC Tokin Corporation based on its original polymer technology, for the first time in the market. This device is capable of implementing all of the functions available with ordinary

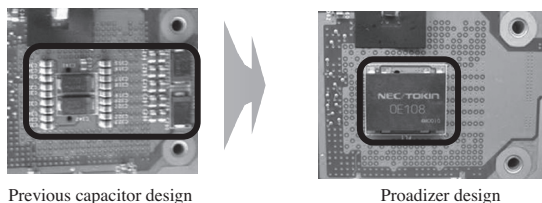


Fig. 1 New decoupling device “Proadlizer.”

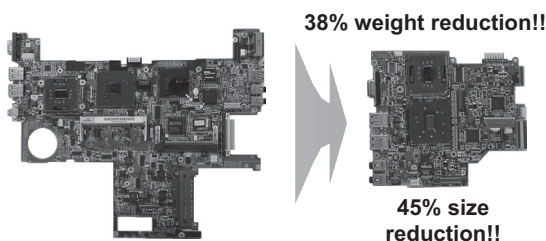


Fig. 2 Comparison of mother board size/weight.

decoupling circuitry so that it can replace the large number of capacitors required for a decoupling circuit as shown in Fig. 1, thus making it possible to reduce the size as well as the weight of the power supply circuitry.

As a result, the weight has been reduced by about 38% and the size has been reduced by about 45% compared to the previous model (Fig. 2).

3. Measures Aimed at an Extension of Battery Life

Adoption of a thorough power consumption reduction technology and a careful selection of components have extended the drive time by about 40%, or to 7 hours*, at the same time as reducing the volume by 2/3rds compared to the previous model.

(1) Selection of Low Power Consuming Devices

For every device mounted on the mother board, the device with the lowest power consumption has been carefully selected.

The chipset made by Intel was selected because its power consumption is lower than that of its competitors. This device has made it possible to maximize the power saving properties by achieving the effective utilization of the functions incorporated in it. For example, the power management function and the function for reducing the operating clock frequency of the graphic function by load conditions.

(2) Power Supply Circuitry

To improve the power efficiency in the battery drive operation, the battery power supply specifications have been changed from the previous 3-series (3-series, 2-parallel) configuration to the 4-series (4-series, 1-parallel) configuration. This has improved the efficiency under low loads of the selected power supply devices and has enabled a significant reduction in power consumption.

(3) Development of a Low Power Consumption LCD and Compact, High Efficiency Inverter

We have newly developed an inverter featuring a considerable power supply efficiency improvement and have achieved a power consumption reduction while increasing the brightness by about 30% compared to the previous model.

4. Security

The role of information security technology has become important as seen with the measures for meeting the Personal Information Protection Law. At NEC, our PCs are designed by emphasizing security.

*The measurements were made in compliance with the JEITA standard. These vary depending on the model.

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The rest of this section will focus on the main security functions of our new product, particularly the function for virus pattern data updating before OS startup, which is now being incorporated in this kind of product for the first time in Japan.

• Pattern Updating before OS Startup

The function for virus pattern data updating before OS startup (officially called the Platform 5 Update Agent, which will hereinafter be referred to as “this function”) has been incorporated for the first time in Japan. This function was developed jointly by three companies including Phoenix, Trend-Micro and NEC, and consists of updating the pattern file used by TrendMicro’s virus countermeasure software (Virus Buster, the 90-day version of which is bundled in the new product) to the latest condition by downloading it from the Internet before starting up Windows (Fig. 3). This function makes it possible to execute virus checking based on the latest pattern immediately after launching the OS.

This function indicates a new orientation for fighting brutal worms. Viruses capable of employing very advanced attack methods have recently become widespread, including those that are so infectious that a PC becomes infected simply by connecting to the Internet, even when mail or a web page are not accessed. There are also those that are very difficult to be deactivated because they hinder an infected PC from accessing the virus pattern data download site. Virus countermeasure software programs are evolving daily in order to deal with such viruses, but they cannot manifest their full performances if the virus patches are old, for example immediately after purchase or after long holidays. It is very risky for a PC to connect to the Internet in such a condition. This function makes it possible to greatly reduce this risk.

It has the following technical features:

The software that implements this function is installed in the HPA (Host Protected Area) of the HDD and is invisible to an OS such as Windows.

In addition, this function includes an alteration detection facility based on digital sign technology. So, it becomes possible to prevent the software itself from being infected or to be started up abnormally.

Furthermore, the software is designed to run exclusively with respect to Windows, so it does not affect the Windows environment including any user-introduced software that is being used. This function downloads the virus pattern file from the Internet server that is actually used for downloading by the Virus Buster. As a result, it becomes possible to always ensure the acquisition of the latest virus patterns (including at the time of the first startup, at which time the software has not yet been registered). This is always provided that the Virus Buster license has not expired.

5. Conclusion

In addition to the above, the new product has been designed in pursuit of other functions and performances that business users need for mobile notebook PCs. These include a package design that is capable of installing a fingerprint sensor and a cabinet structure that provides a pressure resistance performance of 150kgf.

Following on the spread of broadband communications and the development of wireless technologies, mobile notebook PCs are now considered to be indispensable among the IT armaments of businesses. At NEC, we are determined to establish the posi-

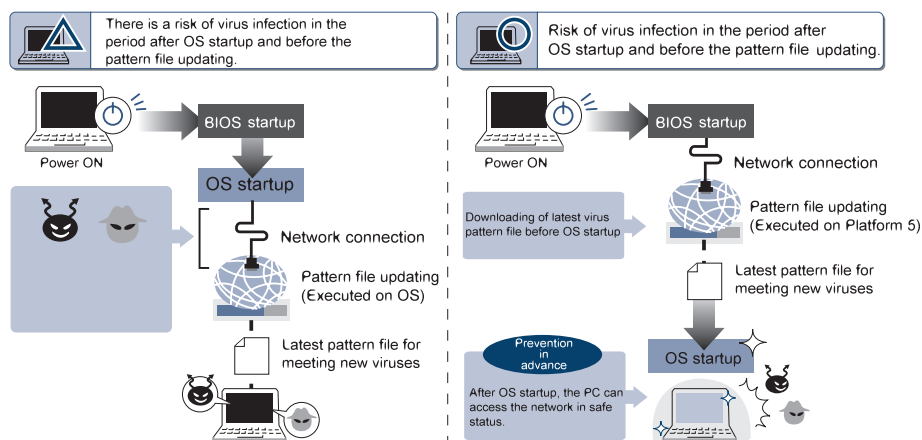


Fig. 3 Flow of pattern updating before OS startup.

tion of our mobile notebook PCs by continuing our efforts to develop products that are deserving of the Ubiquitous Age.

Reference

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