No More Passwords! Fingerprint Verification System LSI with Built-in USB Controller

CXD4000R

Now that the information and communication age has begun, concern for information security is increasing rapidly. Furthermore, a wide range of identity verification systems that use biometrics have been implemented. Of these systems, ones that use fingerprints feature highly accurate verification and are economical and easy to use as well. As a result, fingerprint-based systems are seen as the most promising.
Sony, one of the first companies to develop a fingerprint sensor IC and enter this market, has now developed the CXD4000R fingerprint verification system LSI, which is based on a Sony-developed verification algorithm.

- **Integrated 16-bit CPU core (SPC970)**
- **A/D converter**
- **On-chip DRAM**
- **On-chip USB controller**
- **Low power consumption of 300 W (operating)**
- **Single 3.3 V power supply**

System-on-Chip

Figure 1 shows the CXD4000R block diagram, and figure 2 presents an application circuit. Essentially all the functions required for fingerprint verification, CPU, A/D converter, and DRAM, are integrated on a single chip. This device directly inputs the analog signal from a fingerprint sensor. A fingerprint verification system can be implemented in just three chips when combined with flash verification for firmware and fingerprint registration.

Verification Algorithm

This device uses a Sony-developed verification algorithm. This algorithm is robust in the presence of faint or distorted fingerprints, and achieves high-performance verification. (In dual-trial verification, it achieves an incorrect rejection rate of less than 1%, and an incorrect acceptance rate of less than 0.1%.) Verification is performed almost entirely in hardware and is extremely fast. The verification time for a single finger is, excluding the image acquisition time, approximately 40 ms when the clock frequency is 48 MHz.

Interface

The CXD4000R adopts the widely used USB interface (version 1.1) and supports full-speed (12 Mbps) transfers. However, in addition to the USB interface, it also supports a standard serial interface with both start-stop synchronization and clock synchronization systems. Thus the CXD4000R can be used not only with personal computers, but also with a wide range of other systems as well. (See figure 3.)

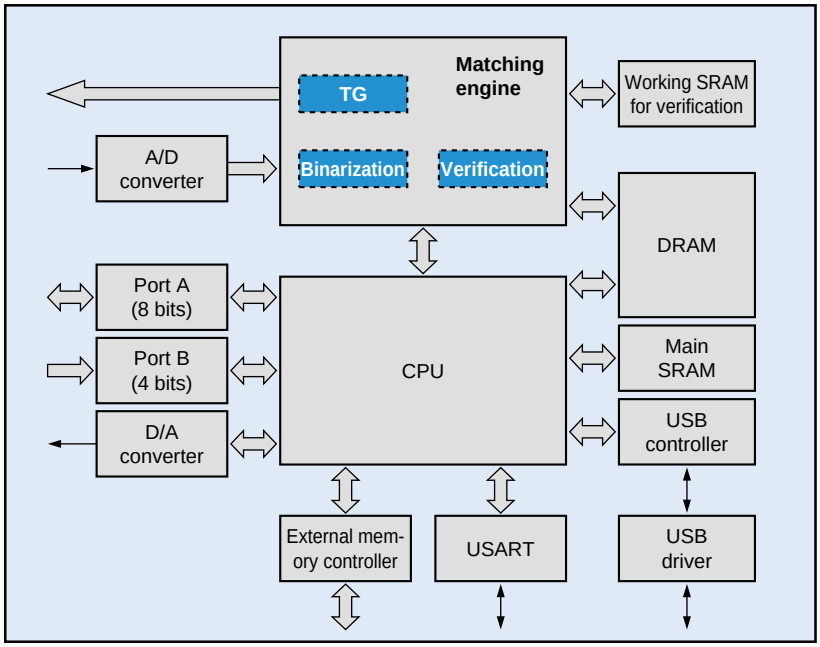
Low Power Consumption

The CXD4000R provides fine-grained clock control. That is, it allows clock signals to only be supplied to required functions when they are actually used. This eliminates unnecessary energy consumption and achieves low-power operation.

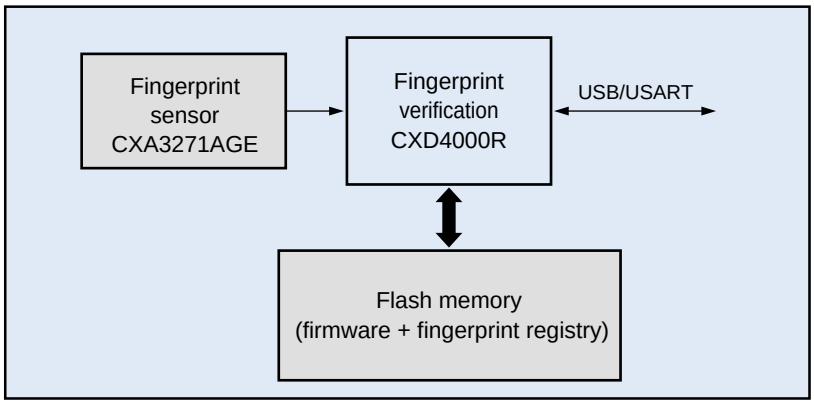
V O I C E

This was my first experience with system LSI design. While I did feel the pressure, I also enjoyed designing this product, since I was learning something new every day. I think I was able to create an LSI that is easy to use and makes the user's job easier. Security problems can be resolved by the chip set of the CXD4000R and CXA3271AGE fingerprint sensor once and for all.

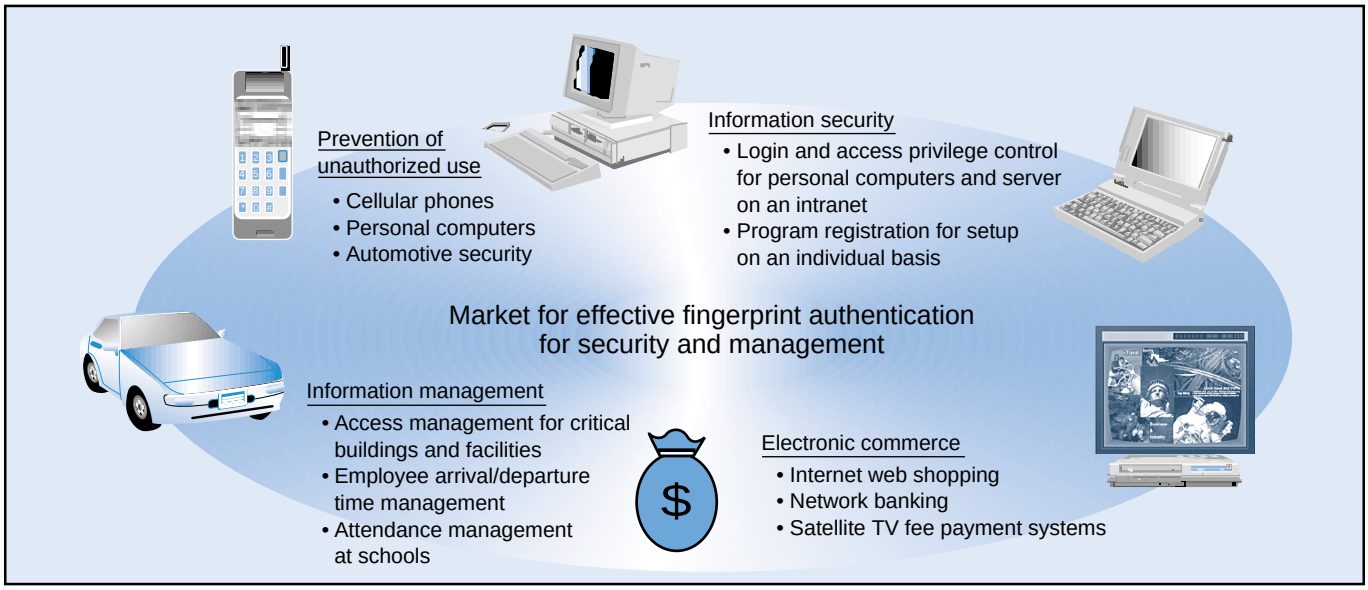
New Products



■ **Figure 1 CXD4000R Block Diagram**



■ **Figure 2 CXD4000R Application Circuit**



■ **Figure 3 Application Development**