Kawasaki Microelectronics†

Abstract:

Kawasaki Microelectronics (KME) develops and markets ASIC products with true originality and high reliability. Taking advantage of its remarkable technical capabilities, KME has constructed a new business model for the ASIC industry called "horizontal international specialization." This paper presents an outline of KME's business.

1. Introduction

Kawasaki Microelectronics (KME) is an independent manufacturer specialized in ASIC (application specific integrated circuits). KME's origin can be traced to the LSI Business Promotion Dept. of Kawasaki Steel established in 1985. KME began full-scale sales after completion of its Utsunomiya Works in 1990. Since establishment, KME has consistently specialized in ASICs, also known as custom LSIs, and has expanded its market from Japan to the United States, Canada, Taiwan, and Europe. In 1994, Kawasaki LSI U.S.A. Inc. (KLSI) was established in San Jose, California as a US sales company, and opened a Design Center in its Head Office and Boston Office. In 2002, KME opened a Sales Office and Design Center in Taiwan. Thus, KME is expanding its business internationally by building a strong customer support organization.

KME was spun off from Kawasaki Steel as wholly-owned affiliate manufacturing semiconductors in July 2001. In April 2003, with the merger of Kawasaki Steel and NKK, KME became a subsidiary of JFE Holdings. This paper presents an outline of KME's business.

2. KME's Business Strategy

The mission of KME's ASIC business is to provide solutions which realize customer requirements on silicon semiconductors as LSI (Large Scale Integration). The necessary conditions for an ASIC business are as follows:

(1) To realize a design which satisfies customer requirements on a design platform (standard cell, cell-based array, embedded array, etc.)
(2) To make the above designwork on hardware which consists of a combination of process technology and packaging technology.
(3) To complete the hardware with a sufficiently short design TAT (Turn Around Time) to satisfy the customer.

Telecommunications and multimedia play a key role in pulling the semiconductor market. Consequently, very high performance and wide product diversity are required, and the product life cycle has become increasingly short. In attempting to respond to this kind of market, the requirements of ASIC customers have become more complex and diverse, and the ASIC maker must clear higher barriers for "chip to work" with a shorter TAT by combining several technologies in the design, process and package. To solve this problem, KME has adopted the following strategies:

(1) To develop the capabilities to provide solutions to customers in focused strong market areas.
(2) To respond to customer requirements flexibly and quickly with a new business model for the ASIC industry called "horizontal international specialization."
(3) To realize the maximum performance of the silicon LSI by a concentrated effort to understand silicon, together with design engineers and device engineers.
(4) To realize designs which satisfy customer requirements with a shorter TAT by enhancing design technology and design support capabilities, including customization of CAD tools.
(5) To enhance the technical capabilities of testing, failure analysis, inspection, and evaluation so as to provide assurance of reliability to the customers.

Table 1 shows KME's ASIC solutions.

3. Technologies Supporting ASIC Business

3.1 Macro·Core

One key element in ASIC design is Macro·Core. When a system is integrated on a chip, the external

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Table 1 Kawasaki Microelectronics' ASIC solutions

Application area	
· Communication	: LAN, MAN
· Image and multimedia	: DSC, LCD projector, Copying machine
· PC related	: LCD controller, USB, CD/DVD drive
· Wireless and mobile	: W-CDMA, GPS
Major Macros (Product)	
· High speed I/O (Interface)	: USB2.0, IEEE1394, LVDS, PCI interface, SerDes (Gigabit Serial Link Core [1]), High Speed Analog Macro
· IP Macro	: Bluetooth™*1, 2), GPS RF Frontend, JPEG[3]
· CPU Core	: ARM7TDMI™*2, KC80, KC160
· Special Process	: LCD driver[4], VCXO & TCXO
Design service and support	
· Integrated design tools and technical service · Various design interfaces with customer · Design centers Head Office, Makuhari, Japan; San Jose, Boston, USA; Taipei, Taiwan	
Technology	
· Wafer process	: Most advanced device (now 0.13 μm). Special device at Utsunomiya Works, KME
· Packaging	: Wide package line-up including advanced CSP and SIP
· Design methodology	: High-end LSI with 10Mgates/500MHz

interface is very important and requires an analog technology which is significantly related to the specific process of the wafer foundry. KME has focused on development of this interface technology, and has created interface solutions such as LVDS for LCD controllers, USB for PC interface and SerDes (Serializer/Deserializer) which is a high speed serial interface necessary for future optical communications by concentrating on understanding silicon in KME's own development or introduction from IP vendors. Thus, these solutions are guaranteed to work reliably on the silicon chip, allowing worry-free use by customers. KME's JPEG Core has a long history and is now playing an important role in digital still cameras (DSC). KME has also provided ASSPs (application specific standard products) composed of these Macro·Core products.

3.2 Design Technology and CAD Tools

It is essential for an ASIC company to have an adequate design support capability for the customers and its own design capability. In recent years, serious problems have occurred in signal integrity and propagation timing due to product requirements such as high performance, high speed and deep sub-micron processes. Consequently, it has become increasingly difficult for customers to satisfy performance and design TAT requirements with a conventional design flow based on a wire load model. To develop an advanced design flow which solves this problem, KME cooperated with CAD tool ventures in the US by testing advanced CAD tools at KME and customizing them when necessary. It enabled KME to establish a new design flow for high performance products with a 500MHz operating speed and more than 10M gates ahead of competitors. The new design flow is shown in **Fig. 1**.

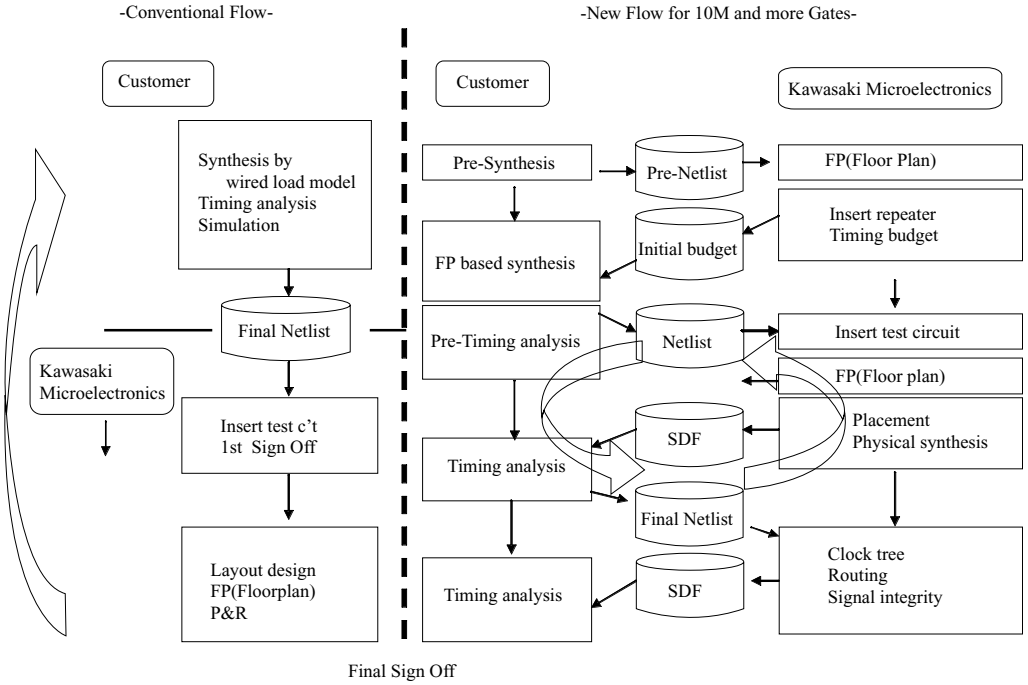

Fig. 1 New design flow

*1 Bluetooth™ is the registered trademark or the trademark in US and the other countries by Bluetooth SIG, Inc., USA.

*2 ARM7TDMI™ is the registered trademark in UK and the other countries by ARM Limited.

3.3 Horizontal International Specialization

KME has outsourced the packaging process from the beginning. In 1999, KME entered into a strategic alliance, including product co-development, with United Microelectronics Corp. (UMC), a major specialized wafer foundry in Taiwan. As an active partner in co-development work, KME has a complete knowledge of the process and device, even when outsourcing. KME has organized a new production system called horizontal international specialization, in which the deep sub-micron products are mainly processed by wafer foundries such as UMC, and the special process is done at KME's Utsunomiya Works.

3.4 Joint Research

As a farsighted policy for developing new applications and basic technologies, KME cooperates with various academic research partners. Katholic Univ. of Leuven in Belgium was a partner in the new architecture development for the GPS-RF product[5]. Kobe Univ. in Japan cooperated in CAD tool development[6], and UCLA now supports basic high speed interface technology.

4. Summary

KME ranked at the top in overall scores when Nihon IDS Corp. made its 2nd investigation of semiconductor customer satisfaction in July-September 2001[7]. In the future, KME will deliver optimum solutions in a timely manner, and will continue to work to improve customer satisfaction as a reliable ASIC partner.

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