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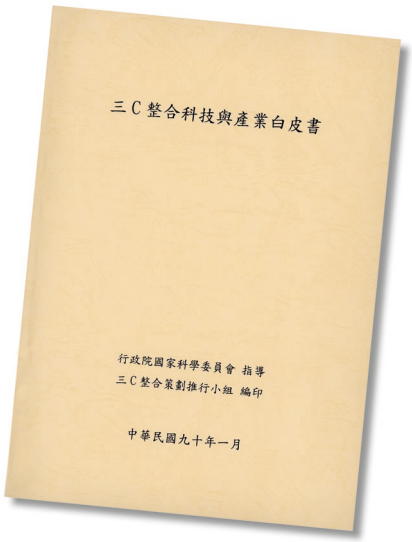
White Paper on 3C Integration Technology and Industry (Volume 2)

Following the spread of the Internet, worldwide telecommunications deregulation, and the development of practical, everyday high-tech products, digital convergence and "system-on-a-chip" (SOC) technology are blurring the distinctions among computers, communications, and consumer electronics (3C). Today 3C integration represents an important emerging industry and technology trend.

Thanks to rapidly advancing semiconductor process technology, the narrowest line width that can be fabricated will shrink from 0.18μm today to 0.05μm within the next decade. When that time comes, the memory that can be contained in a square centimeter chip will increase to 256 billion bits (from one billion today), the speed of integrated circuit chips will rise to 1,800MHz, and the number of input/output legs that can be mounted on a chip will be as high as 6,000. This implies that a single chip will be able to perform a wide range of functions, offering industry many new IC design opportunities.

There are more than 100 specialized IC design companies in Taiwan, and this industry is second only to that of the US in size and importance. Taiwan's chip design industry unquestionably plays an essential role in the global semiconductor industry. It is also indisputable that the value chain established by the IC industry gives it a large advantage over international competition in the emerging area of SOC design. Taiwan's IC industry, however, must now strengthen its system design and specification drafting ability as it moves into the field of SOC design. If industry can do this, it will be able to exploit new opportunities and gain a competitive advantage while preserving its current niche.

While conventional computers will continue add functions, become more powerful, and upgrade their specifications in the post-PC age, information appliance products (IAs) will conquer the market mainstream as a simple, easy-to-use, low-cost means of going online. Taiwan's output of SOC-based information appliances surged during the past year, giving the industry a big boost towards becoming the world IA output value leader within the next five years.



White Paper on 3C Integration Technology and Industry (Volume 2)

Since 3C integration will have a tremendous impact on Taiwan's future industrial and technological development, the NSC commissioned the NII Industry Development Institute to draft a long-range roadmap for the development of the 3C industry and 3C technology. This roadmap took into consideration international trends in 3C integration technology and 3C industry, as well as the current state of the industry and 3C technology in Taiwan, and reflected the suggestions of domestic and foreign experts.

Following completion of a two-stage planning process, an implementation proposal for the 3C integration technology plan started taking shape in May 1997. Plan implementation began after approval by the NSC, and will continue throughout the four-year period from May 1999 to April 2003. Formally established in May 1999, the 3C Planning and Implementation Task Force has been achieving excellent results. The following are among some of the most notable achievements of 2000: (1) Flagship made-in-Taiwan IA products were developed; (2) The industry was provided assistance in applying for technology project funding; (3) An SOC design center was planned; (4) The NSC National Chip Implementation Center established an IP information center and performed technology transfer; (5) 3C programs and courses were organized at universities and colleges; (6) An NGI international cooperation project was implemented; (7) International conferences lent impetus to the joint promotion of 3C integration throughout domestic and international industry.

Apart from these results, another major event was the publication of the "White Paper on 3C Integration and Industry." Following the publication of the warmly-received white paper for 1999 (volume 1) in January 2000, the 3C Planning and Imple-

mentation Task Force has recently published a white paper for 2000 (volume 2). The White Paper contains the newest information concerning the past year, explores the current state and future prospects of domestic and international 3C technology and markets, and explains Taiwan's relevant policies and promotional measures. We believe that the White Paper on 3C Integration and Industry will be of great interest to individuals in industry, government, and academic and research institutions. With the assistance and active participation of all relevant parties, we believe that Taiwan will soon become one of the world's leading centers of 3C integration product research and manufacturing.

Overview of the National Program on Hazards Mitigation

Natural disasters often cause loss of life and severe property damage in Taiwan due to its geographic location at the earthquake active area of the Pacific Rim. Without effective disaster prevention and reduction work, residents in Taiwan are highly vulnerable to natural disasters. The impact of natural disasters brought the government and the private sector an understanding that effective disaster prevention and reduction measures must be taken as soon as possible and realizing the importance of disaster prevention research. In 1997 the 134th NSC board meeting consequently approved the "Guidelines for the Implementation of National Technology Programs" and the "Conceptual National Program on Hazards Mitigation," while initiating program planning work. In November of the same year the 138th NSC board meeting officially approved the National Program on Hazards Mitigation. The period between November 1997 and July 1998 was designated as the preparatory year for executing this national program with the subsequent three years as the first implementation phase.

Most work during the first phase of program consisted of disaster prevention and reduction R&D aimed at the severe typhoons, torrential rains, and earthquakes that frequently attack Taiwan. This work was carried out by typhoon mitigation section, consisting of meteorology, flood prevention, and debris flow portions, earthquake mitigation section, and disaster prevention system section, including an information system sections. Specific program topics included: (1) To assemble databases for both the natural and socio-economic environments needed for development and implementation of hazards mitigation measures. (2) To develop methodologies for hazards potential analysis and to apply them to analyze the hazards potentials islandwide. (3) To select one or two pilot areas to develop the methodologies for conducting risk assessment and for simulating hazards scenarios. (4) To develop decision-support and display systems in order to incorporate the assessment and simulation results so that the government agencies and private organizations can use the research results in the execution of their work. (5) To develop the hazards mitigation plans for the pilot areas based on the research results for these areas; then to test the hazards mitigation plans by the government agencies which have direct jurisdiction over the pilot areas for implementation; and finally, to evaluate the test results in order to establish appropriate operational procedures. (6) To review and assess the current Hazards Mitigation Management System and its operations and related codes and regulations; then to combine these review results and the new research results from item (2) to (5) above to propose changes in current mitigation operations and to guide future improvement of the whole hazards mitigation work.

The National Program on Hazards Mitigation is an inter-agency integrated program planned and implemented by the NSC, Ministry of the Interior, Ministry of Transportation and Communications, Ministry of Finance, Public Construction Commission, Council of Agriculture, Ministry of Education, Department of Health, and Environment Protection Administration. The program results are recognized as pursuing disaster prevention and reduction work. The organization of this national program consists of a steering committee, a consultative committee, a work (coordination) committee, an expert (consultant) group, research groups, and the core implementing "National Program on Hazards Mitigation Office." The NSC chairman and a vice chairman serve as the chairman of the steering committee and the consultative committee, respectively. Research groups perform planned research topics with assistance and improved proposals provided by expert (consultant) group, consisting of relevant experts and specialists. In addition, research groups at government units cooperate and share information with each other, and submit findings and suggestions to the central government's Disaster Prevention and Reduction Board via the Executive Yuan Disaster Prevention and Reduction Consultative Com-mittee.

After approximately two-and-a-half years of work, all tasks are now on-track. Preliminary results have been achieved in the tasks of compiling disaster prevention and reduction databases, conducting hazard potential survey and analysis work, devel-

oping forecasting and warning technology, establishing a disaster management decision-making support system, developing fast post-quake safety diagnosis and reinforcement methods for buildings, devising earthquake-resistant structural design and earthquake-resistance assessment methods, installing and applying the HAZ-Taiwan system modeling system, implementing disaster prevention education, establishing disaster announcement and emergency response systems, reviewing and assessing the disaster prevention and reduction system, and devising disaster mitigation measures. These results provide a solid foundation for the subsequent phases of this program.

A period of five years was planned for the second phase of the program starting from January 2002. The second stage of the National Program on Hazards Mitigation will continue and build on the work performed during the first phase. Apart from the continued implementation of disaster prevention technology R&D, more attention will be paid to applying R&D results to practical disaster prevention and reduction work, with the goal of upgrading Taiwan's disaster prevention and reduction standards. Furthermore, follow-up research related to the Chi-Chi Earthquake will be performed during the second program phase. This research will seek to remedy shortcomings of current disaster prevention and reduction measures, and find ways to improve post-disaster reconstruction efforts.

The National Program on Hazards Mitigation will focus on the following aspects in the future:

(1) The practical application of disaster prevention technology R&D will be strengthened. Assistance will be provided to local governments in drafting local disaster prevention plans and disaster response plans. It is expected to effectively implement R&D results to actual disaster prevention and reduction work.

(2) An increased effort will be made to compile and maintain disaster prevention databases. Research topics will include quantitative rainfall forecasts, hazard potential and risk analysis, disaster simulations, the HAZ-Taiwan plan, a disaster management decision-making support system, disaster assessment and communicating methods, performance and applications of a earthquake quick-warning system, post-quake structural reinforcing technology, and construction inspection mechanisms.

(3) More research will be performed on the socioeconomic aspects of disaster prevention and reduction work, including institutional systems, laws, and cultural, economic, psychological, medical, environmental, and educational phases.

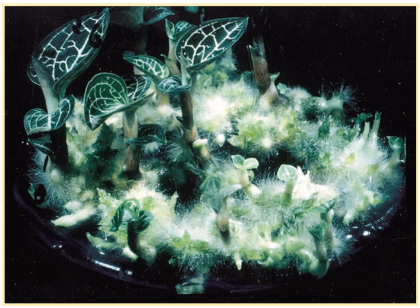
(4) Research will focus on reconstruction in the wake of the Chi-Chi Earthquake and related disaster prevention topics.

(5) In conjunction with the work of the Executive Yuan Disaster Prevention and Reduction Consultative Committee, an active effort will be made to establish a disaster prevention and reduction technology center. This center will provide integration, coordination, and utilization mechanisms for disaster prevention work.

Disaster prevention and reduction is a far-reaching and long-term task. A broad range of issues should be considered for devising and implementing effective disaster prevention and mitigation strategies. For instance, a solid technological basis must be available for tasks such as hazard potential analysis, disaster risk assessment, land use planning, the drafting of building standards and guidelines, the formulation of disaster prevention and reduction plans, the establishment of disaster prevention and reduction organizations, the application of disaster prevention and reduction technology, public disaster prevention education, financial incentives and insurance, and the assessment of disaster prevention and reduction performance. In addition, the effective implementation of disaster prevention measures relies on the cooperation and participation of central government agencies, local governments, private organizations, schools, communities, and all citizens. The National Program on Hazards Mitigation therefore has the dual missions of devising disaster prevention and reduction measures and integrating and coordinating the implementation of those measures. It is hoped that the results of strengthened disaster prevention and reduction research can be applied to build a cost-effective disaster prevention system and to assist the drafting of effective disaster prevention and reduction measures. The ultimate goal of this national program is to minimize disaster losses and risk, while providing our society a basis for sustainable development.

Results of the National Project on Agricultural Biotechnology

The Executive Yuan passed the "Implementation Program to Strengthen the Biotechnology Industry" in 1995. Under this program, three areas of agriculture-flowers and ornamental plants, animal vaccines, and phytopathology-were listed as research priorities. In addition, the Tainan Science-based



The rare wild forebear of the medicinal plant Anoectochilus formosanus.

Industrial Park set flowers and ornamental plants, phytopathology and biological preparations, aquaculture, and animal vaccines as its developmental objectives. With this background in mind, the National Project on Agricultural Biotechnology selected the following seven focal areas when it was established in August 1998: (1) flowers and ornamental plants (2) phytopathology (3) aquaculture (4) animal products/animal vaccines (5) agricultural product freshness preservation/utilization (6) environmental protection and (7) medicinal plants. Various projects have been planned in all of these areas to accelerate the R&D process and develop products possessing international competitiveness.

The national project's mission is to integrate interdepartmental resources for the sake of stimulating the development of Taiwan's agricultural biotechnology industry. Units providing funding include the NSC, the Council of Agriculture, and the Academia Sinica. Total funding for 2001 is approximately NT$180 million. The project office is currently controlling implementation of 78 ordinary projects in the seven key areas (upstream development research is the responsibility of the academic sector), of which nine are new projects approved in 2001. Three R&D application projects carried out jointly by the academic sector and industry are currently underway, and another four in-review projects include a study of the Chinese caterpillar fungus funded by the Taiwan Sugar Corp.

To take the areas of flowers/ornamental plants and medicinal plants as examples of the results being achieved, 155 strains of Oncidium orchid have been gathered and subjected to viral evaluation, and a virus-free germ plasm collection made. Some of the collected germ plasm has been hybridized, registered, and analyzed, with results showing that there are extreme differences in the lineages of hybridized varieties. This information will serve as a basis for future breeding strategies. As for research on Oncidium orchid tissue culture and propagation, it has been found that a somatic embryo can be formed directly from the epidermis and sub-epidermal tissue at the surface of a wound. This regeneration process, which does not involve scar tissue, had not been reported for Oncidium or other orchid species, and represents an important breakthrough.

In research on medicinal plants, a project to collect, research on the phylogeny and development of tissue culture technology for the orchid *Anoectochilus formosanus* was completed. Screening of *Anoectochilus formosanus* for heat tolerance was performed and symbiotic fungus employed to promote the growth of this species. An evaluation system was set up to test extracts of *Anoectochilus formosanus* and Chinese yam for ability to fight cancer and stimulate immune function. Results have verified that *Anoectochilus formosanus* possesses antioxidant, antibacterial, and tumor-fighting properties. Toxicological and pharmacological safety evaluations and functional assessments of *Anoectochilus formosanus* will provide valuable information for firms that wish to use this plant in health foods. The medicinal efficacy of *Dendrobium moniliforme* was explored using a basal eye disease model of retinal pigment epithelium cells, and it was found that water-soluble *Dendrobium* extracts can promote the genetic expression of liver growth factor from retinal pigment epithelium cells. This findings supplies scientific corroboration to the old observation in Chinese medicine that *Dendrobium* "clears and brightens the eyes." In addition, work was performed on *Dendrobium* phylogeny, identification, introduction, control of flowering mes, and artificial pollination.

Besides the outstanding results that were obtained in the above areas, research results in other areas have also been extremely promising. New technology developed in 25 research projects on key areas has recently been publicly issued to industry, and more than 30 firms have expressed interest in using findings from 23 of these projects. As for 35 three-year projects, the eight projects that have been completed before the end of three years have been acclaimed as very successful. In summary, the National Project on Agricultural Biotechnology is making a tremendous contribution to developing the potential of Taiwan's agriculture and making Taiwan an Asia-Pacific regional biotechnology industry R&D center.

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