Multi-Project Chip Service for Universities and Industries in Taiwan

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Abstract :Acting as the bridge between the IC designers and manufacturing companies, Chip Implementation Center (CIC), founded in 1992 under the National Science Council of R.O.C., aims at providing the services for fabrication of multi-project chip, procurement / integration of software CAD tools, and promotion of IC design / testing / CAD software technology.

To date, CIC has assisted 62 universities and 14 polytechnics to install 7932 academic licenses of software CAD tools. In 1999 fiscal year, 522 chips of the academics have been fabricated through the easy-of-access and fast-turnaround multi-project chip service provided by CIC.

CIC runs various training courses intensively and periodically, including Full-custom IC design, Cell-based IC design, FPGA design, MMIC design, and so on. In the 1999 fiscal year, CIC held 33 kinds of courses with 130 classes and about 5402 trainees.

The prosperous development of IC related industries such as computer, communication, multi-media, etc. is greatly expected. In view of this, CIC will keep on collaborating with the academics/industries/research institutions, devoting itself to training more well-qualified designers, and strengthen the IC/System technology level.

1. Introduction

Since 1991, the integrated circuit has remained on the top of all the imports of the Republic of China. In view of this, the National Science Council(NSC) in 1992 initiated a special program(Chip Implementation Center Promotion Project) in preparation for a national research and service center aiming to raise the IC/System design technology and cultivate IC/System design professionals of the R.O.C. The missions of Chip Implementation Center are:

- Assist the academia to set up the design environment.
- Provide easy-of-access and fast-turnaround chip fabrication service.
- Promote the international cooperation, and introduce more advanced IC/SYSTEM technologies.

Located in Science-Based Industrial Park, Hsinchu City, CIC is originally aimed at serving the universities and polytechnics, but recently some of the services have been expanded to the research institutions and related industrial sectors.

2. Status

2.1. Assist the academia to set up the design environment

CIC applies some CAD tools which have been widely used by the industry and integrates them

into full IC and system design environment for the academia such as those of Full-custom IC, Cell-based IC, MMIC and FPGA. On the other hand, by negotiating with the tool vendors, CIC assists the academia to procure some IC design softwares on a very favored price(US$ 150-400 per set or even free). So far, Cadence, SPW, Avant!, HSPICE, TMA, Synopsys, Viewlogic, Tanner, SuperCompact, SBTSPICE, Xilinx, Altera, etc. are available, as listed in Table 1.

Table 1. No. of software procured through CIC

Company	Package	Total(sets)
Cadence	Frontend Design	1001
	Backend Design	999
	PCB Design	132
	System Design	223
Avanti	HSPICE	612
	TMA(2d/3d/inter/pro)	69/41/45/68
	Avanti	136
SpringSoft	Debussy	202
SBTSpice	SBTSpice	560
Synopsys	Synopsys	439
	VCS	46
Ansoft	Harmonica	249
	Symphony	226
TANNER	TANNER	662
VIEWLOGIC	Workstation/PC	79/316
XILINX	Workstation/PC	137/1690
ALTERA	Workstation/PC	214/1526

Besides, CIC provides technical support of these tools to the academia including installation, maintenance and consultation. To date, about 62 universities and 14 junior colleges have been equipped with the above-mentioned softwares, and 700 professors have applied these tools to teaching and researching, as shown in Fig. 1.
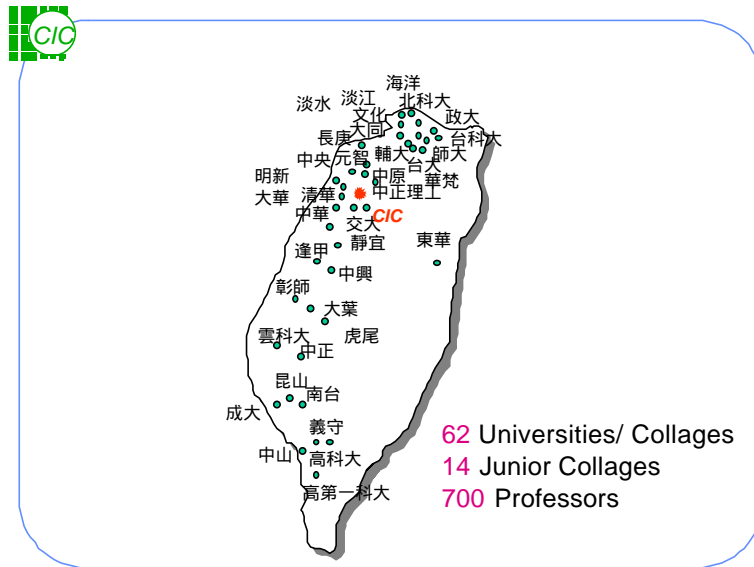
Fig. 1. Service around Taiwan

2.2. Offer chip fabrication and measurement services to IC/System designers

CIC selects some IC processes well developed by the domestic foundries(TSMC, UMC, MOSEL, EPSIL, and HW etc.) and some special processes from foreign organizations(MOSIS, CMP, IMEC, TRW, and GCS) to serve the nationwide designers for prototyping IC manufacture, as shown in Fig.2.

Fig. 2. Roadmap of CIC MPC service

	1996	1997	1998	1999	2000	2001
0.8 um 1P2M CMOS (TSMC)						
0.6 um 1P2M CMOS (TSMC)						
0.6 um 1P3M CMOS (TSMC)						
0.35 um 1P4M CMOS (TSMC)						
0.8 um 2P2M CMOS (UMC)						
0.5 um 2P2M CMOS (UMC)						
0.35 um 2P3M CMOS (MOSIS/TSMC)						
0.8 um 2P2M BICMOS (CMP/AMS)						
2.0 um HBIMOS(IMEC/Mietec 100V)						
1.0 um MESFET GaAs (HEXAWAVE)						
0.2 um HEMT GaAs (CMP/PML)						
0.15um/0.1um PHEMT (TRW)						
1.4 um/HBT 0.3um/PHEMT(GCS)						
0.45 /SRAM 0.35um /Flash(MOSEL)						

By the method of Multi-Projects Chip (MPC), several designs from the industries, academics or research institutions are merged into one set of photo-mask to share the resource and cut the cost. Up to now, 1855 prototyping ICs from the academics, as shown in Fig. 3, and 278 from the industries and research institutions have been fabricated. As far as the measurement is concerned, CIC supplies the IMS testing system for verifying both of the digital and analog designs. In addition, the probe station with the function of laser cutting is also available for IC testing and debugging.

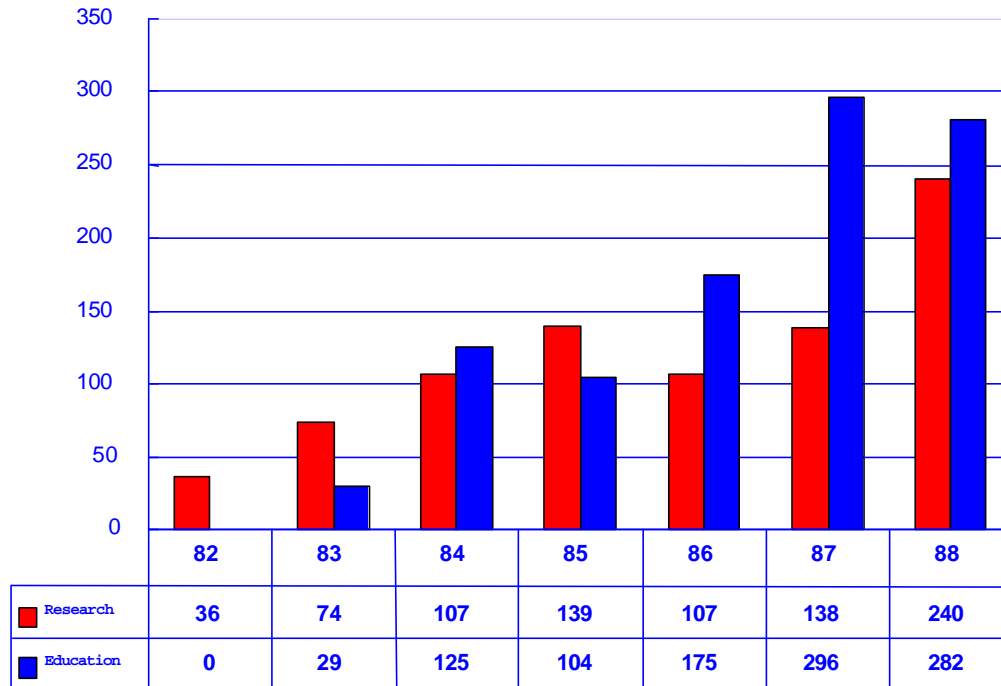|	82	83	84	85	86	87	88
■ Research	36	74	107	139	107	138	240
■ Education	0	29	125	104	175	296	282

Fig. 3. No. of chip prototyped

2.3. Run training courses and hold workshops

CIC runs intensive training courses respectively in the summer and winter vacations for the academics. These courses include Full-custom IC design, Cell-based IC design, FPGA design, MMIC design, and so on. In the 1999 fiscal year, CIC held 33 kinds of courses with 130-plus classes and about 5402 trainees, as shown in Fig.4. During the semesters, however, CIC's engineers will leave for the universities and colleges to give lectures. As to courses for the industrial sectors and research institutions, they are opened unperiodically. Sometimes, CIC invites scholars or specialists to deliver speeches in the workshops.

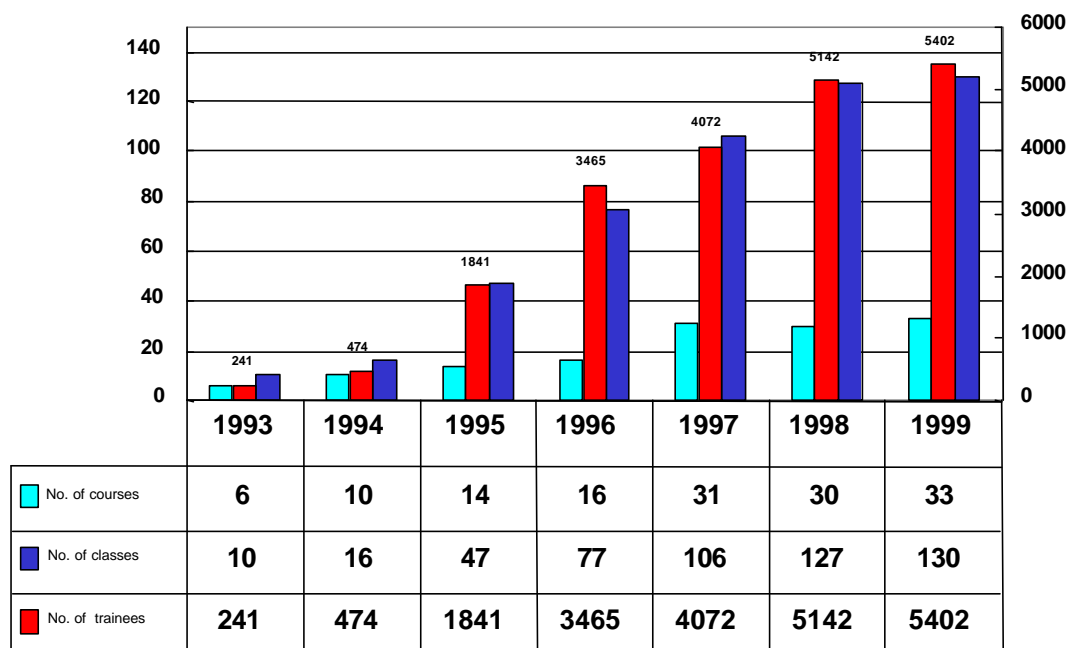|	1993	1994	1995	1996	1997	1998	1999
No. of courses	6	10	14	16	31	30	33
No. of classes	10	16	47	77	106	127	130
No. of trainees	241	474	1841	3465	4072	5142	5402

Fig. 4. No of students attending the training courses.

4. Promote technology exchange and international cooperation

Through well-planned computer networks, CIC's information and technology data are easily accessible to the designers. Besides introducing IC processes from home and abroad, CIC cooperates with some research institutions such as CCL/ITRI, MDC/CSIST and the Academia Sinica to develop some IC related technologies.

III. Prospect

Within years, hundreds of billion dollars will surely be invested in building the 8 and 12 inches IC foundries. Moreover, the prosperous development of some IC related industries such as computer, communication, multi-media, etc. is greatly expected. In view of these, CIC will keep on collaborating with the academics, industries and research institutions, and devoting itself to training more well-qualified designers and enhancing the IC/System technology level so as to reduce our dependence on the imported ICs.