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On the way to construct the first IC wafer fab

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I. INTRODUCTION

Vietnam with nearly 90 million population is a huge market that has been considering as the next tiger country in Asia according to the report of Frost and Sullivan 2008 [1]. The median of the population is 26,4 years which is much lower than the one of other Asian countries like China, Taiwan and Singapore. Other favored factors for Vietnam to attract foreign investment are low wage and high number of fresh graduates from universities. Based on the population, the percentage of fresh graduates of Vietnam is 2.7% compared to 1.7% of China [2].

In recent analysis of market trends in Electronics and Semiconductor Manufacturing in Vietnam [3,4] indicates that the semiconductor consumption in Vietnam will reach about US$6.8bn by 2014 driven by growing affordability of key products, with a steady annual growth rate of 13%. The revenues of EMS/ODM, those companies who leverage the low cost manufacturing in Vietnam reached US$1.5 billion in 2012. In addition to that, the OEM electronics manufacturers (Sony, Samsung, Canon etc.) have established strong manufacturing operations in Vietnam with growing revenues obtained US$11.4 billion in 2012.

Awareness of the importance of the semiconductor industry to the country's industrialization and modernization efforts, the Vietnamese government decided to set up a wafer-fabrication plant in Ho Chi Minh city. This IC wafer-fab is necessary to foster the semiconductor manufacturing industry since it is the backbone of the electronic industry that provides future jobs. The wafer-fab is going to play an important role in the industry landscape of Vietnam. It will help train and produce skilled engineers in semiconductor discipline, act as a motor to drive manufacturing excellence. It also helps the young Vietnamese chip designers to develop their skill and work with the existing backend companies in Vietnam to offer "one stop" service in semiconductor manufacturing services.

The technology chosen for this first wafer-fab is 0.18um/200mm costing US$300 million. This fab will be able to make about 400 million chips per year targeting minimum business revenue of about US$ 120 million/year [5,6].

II. CHIP DESIGN AND EDA PRESENCE

A. *Chip design companies*

In developed countries, 60% of the jobs are related to the electronics. If we compare Vietnam with other countries like Korea, Taiwan, Singapore or Malaysia, we have to recognize that Vietnam is far behind those countries. This is partially because they have recognized the importance of semiconductor manufacturing very early and did the move from labor-intensive industry to the "high-end" industry to climb up the ladder of the supply chain. Currently, there are about 30 private both domestic and foreign custom chip design firms operating in Vietnam. The table 1 summarizes the top-ten companies that share nearly 90% Vietnamese market. It can be seen that most of them are located in Ho Chi Minh city, the biggest economic city of Vietnam.

	Company name	Operation and Products
1	Intel Ho Chi Minh	Assembly and packaging http://www.intel.com
2	Renesas Ho Chi Minh	ASIC digital IC design (Front-end) http://www.renesas.com/
3	Acrosemi Ho Chi Minh	ASIC digital IC design (Front-end) http://www.acrosemi.com
4	E-Silicon Ho Chi Minh & Da nang	ASIC IC design (Back-end) http://www.esilicon.com/about/location/esilicon-in-vietnam
5	Splendid Technology Ho Chi Minh	RFID design & solutions http://www.splendidtechnology.com.vn
6	Signet Design Solutions Ho Chi Minh	ASIC IC design (Back-end) http://www.signetdesign.vn
7	Dolphin Technology Hanoi	Silicon proven IP design http://dolphin-ic.com
8	Active-Semi Vietnam Hanoi	Power management chip design http://www.active-semi.com
9	Viet Vmicro Ho Chi Minh	Analog IC design http://www.vietvmicro.com
10	VSMC Ho Chi Minh	Power management chip design http://www.vsmc.com.vn/

Table 1: Top-ten companies in semiconductor and IC design

B. *EDAsuppliers*

In contrast to the number of chip design companies operating in Vietnam at the moment, there is only one active EDA supplier present in Vietnam - Synopsys. All IC design

Capital	Hanoi
Largest city	Ho Chi Minh **City**
Language	Vietnamese (*de facto*)
Area Total	331,210 km²
Population (2012 estimate)	90,388,000
Currency	Vietnam Dong (VND)
Time zone	**(UTC +7)**
Internet TLD	.vn .gov .edu

companies above use design flow and EDA tools from popular suppliers such as Synopsys, Cadence and Mentor Graphics. The table 2 indicates IC design software are not only used for industry but also taught at universities in Vietnam.

ASIC digital IC design (SYNOPSYS, MENTOR GRAPHICS, CADENCE)	-Front end: Leda, VCS, ModelSim, -Back end: Design Compiler (DC), Hercules, IC compiler (ICC), PrimeTime, Encounter
Analog IC design (SYNOPSYS, CADENCE, MENTORS, ZENI)	-Synopsys (CosmosSE, Hspice, Cosmossope, CosmosLE, Hercules, Star-RCXT); Cadence (Virtuoso), Mentor (ICstudio, DA-IC, Eldo, ICstation,Calibre mnDRC/nmLVS, Calibre xRC.), Zeni (ZeniDM, ZeniSE, ZeniPDT, ZeniVERI)
FPGA-target IC design (ALTERA, XILINX)	-Quartus II, IDE

Table 2: EDA tools are teaching and using in Vietnam

III. ACADEMIA

Most domestic and international technology universities and institutes only teach the design of the integrate circuit in Vietnam and then have them manufactured in foreign countries. The figure 2 shows major universities and research centers along the S-shaped country. It can be seen that most of famous universities and institutes located in the South of Vietnam.

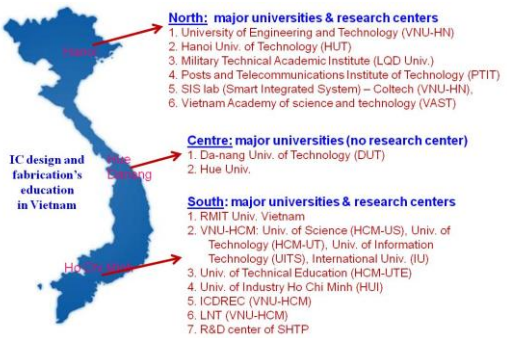

Figure 1: major universities and research centers in Vietnam

ICDREC, established in 2005, is one of the nation's leading centers in training and transferring technology for the IC industry. Located in Ho Chi Minh City, the centre has long been known for its successful design of the 8, 16 and 32-bit chips, used for many handling and telecommunication devices – see figure 2.

Figure 2: Some chip designed in Vietnam and fabricated aboard

Currently, technology universities and research institutes provide different level electrical and electronic programs and training courses at different levels such as bachelor, engineer, master and PhD. The programs and training courses focus mainly on EDA tools and IC design – both analog and digital, as summarized in table 3. However, there has been no courses or educational programs related to IC fabrication and technology.

Educational programs	Duration	Univ./Institutes
Bachelor degree	4 years	RMIT, VNU-HN, VNU-HCM, DUT, HUI, PTIT,VAST, HUI, HCM-UTE
Engineer degree	4.5 years	HCM-UT, HUT
Master degree	1.5-2 years	RMIT, HCM-UT, HUT
PhD degree	3 years	HCM-UT, HUT

Table 3: Educational programs related to IC design in Vietnam

Among them, RMIT Vietnam is a leading university that provides variety of programs at bachelor and master levels with majors not only digital IC design but also analog and high speed design. RMIT also offers the unique test technology program that has been developed with sponsorship from IEEE I&M society.

IV. GOVERNMENT PROGRAMS

Vietnam has an ambitious plan to industrialize country by approving nearly 1.872 industrial parks all over the country [7]. Among them, Saigon Hi-tech Park (SHTP) is one of favorable destination for IC design and manufacturing companies such as Intel, Signet design solutions, etc. Vietnam government places IC design and fabrication as one of top-priority programs to develop from 2010-2020. By 2017, the program targets to achieve a high-value integrated IC industry worth $100-150 million, contribute to technical innovations in defence and security, and attract more than five multinationals semi-conductor corporations to Viet Nam [6].

Furthermore, the government appeals young Vietnamese engineers graduate from advanced technology countries like America and Japan returning to homeland to contribute to the development of the semiconductor industry.

REFERENCES

[1] Frost and Sullivan, "Vietnam - The Rising Tiger in the Semiconductor Industry", 2008, http://www.frost.com
[2] General statistics office of Vietnam, http://www.gso.gov.vn/default_en.aspx?tabid=467&idmid=3
[3] Semiconductor consumption projection in Vietnam, http://www.2456.com/JasperWeb/htmls/Show/269/MarketNews_en_20100210.html#top
[4] Philip Koh, "Market Trends: Electronics and Semiconductor Manufacturing, Vietnam, 2010-2015", http://www.gartner.com/id=1702914
[5] "Du an dau tu nha may san xuat chip", http://www.sgi.com.vn/Default.aspx?mod=project&atv=project_detail&idtype=2&idproject=29
[6] An Vu, "Integrated chip manufacturing takes off," 2013, http://vietnamnews.vn/Sunday/Features/224731/integrated-chip-manufacturing-takes-off.html
[7] Industrial zones in Vietnam: http://industrialzone.vn/

Biography

DANG Trong-Trinh was born in Vinh-Phuc, Vietnam in 1978. He received the B.S degree in Electronics and Telecommunication from Vietnam National University of Hanoi (VNUH) in 2001, the Master degree in Micro and Nano-electronics from the Joseph Fourier University in France in 2005, and PhD in Microelectronic from INPG in France in 2008. He is currently working at RMIT University Vietnam. His research interests are focused on Digital IC design and fabrication, DSP.