

“Understanding Foundry”

-

ABC -

2004.9

DISPLAYBANK

(duke@displaybank.com)

IDM

가

vs

史

가

IDM -

■ ,

가

' 가가 '

, , , ,

가 ,

, 가 , 가 ,

. 1

, 1

가

■

IDM(), () , ()
, IBM, TI(Texas Instrument) IDM
가

IDM

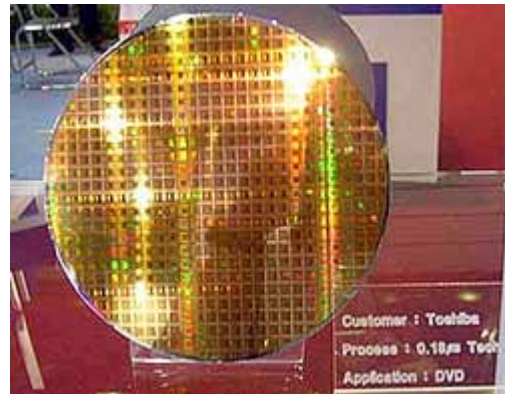
ASIC/SOC

IDM

IDM

가

SOC



0.18µm , DVD

TSMC (Taiwan Semiconductor

Manufacturing Company), UMC (United Microelectronics Corporation)가 70%

5%

SOC

가

■

가

가

가

가

가

IC

IDM

IC

가

12

0.13

30

가

8

0.35

, 13 가 .

[]

구분	2002	2003	2004	2005	2006	2007	CAGR
반도체	1,551	1,680	2,067	2,517	2,386	2,519	10.2%
파운드리	104	129	178	241	232	264	20.4%
(비중)	(6.8%)	(7.7%)	(8.6%)	(9.6%)	(9.7%)	(10.5%)	

Gartner, 2003 8

IDM

가
가 IDM

[]

Year	1983	1987	1990	1994	1997	1999	2001	2003
(")	4/5	5/6	6	6/8	8		12	
	1.2 μ m	1.0 μ m	0.8 μ m	0.5 μ m	0.35 μ m	0.25 μ m	0.13 μ m	90nm
(US\$m)	200	300	400	700	1,250	1,750	3,000	3,600

Digitimes, 2004 9

가 가

, 가
가
IDM 가 IDM
가 가 , 가 가 가 가

, IDM 가
IDM ,

가

가

■ IDM

IDM

가 , 'IDM-light'

가

. LSI 社 2003 2 25%

60%

10%

5

50%

가

가

TI 2004

20% 가

(Kevin March) CFO 5

TI TSMC, UMC, SMIC

0.13

48%

IDM

. 2002 TSMC

, ST 90nm, 65nm CMOS

e-DRAM

. TSMC

12

65nm SOI(silicon-on-insulator)

2003 UMC AMD (Infineon Technologies) 65nm 45nm

. 2004 3

(Chartered Semiconductor

Manufacturing), IBM (IBM Microelectronics),

65nm

45nm

■
 1987 TSMC(Taiwan Semiconductor Manufacturing Company)가
 UMC(United Microelectronics Corporation) 1, 2 TSMC
 71% 가 2003
 2003 93 TSIA(
 ; Taiwan Semiconductor Industry Association) 2003
 130 가 5
 TSMC UMC가 , 2 IDM
 , LCD ,
 8
 DRAM 12
 " (fab filler)"

[IC (NT\$b)]

	2001	2002	2003	Y/Y	1Q04	2Q04
Design	122.0	147.8	190.2	20%	58	64
Manufacturing (foundry included)	302.5	378.5	470.1	24%	137	160
Foundry	204.8	246.7	309.0	25%	87	101
Packaging	77.1	94.8	117.6	24%	33	38
Domestic packaging	66.0	78.8	97.6	24%	28	32
Testing	25.3	31.8	40.9	29%	12	14
Total	526.9	652.9	818.8	25%	240	276

TSIA, Digitims, 2004 9

[2003 5]

		(US\$m)	
1	TSMC	5,855	26%
2	UMC	2,740	27%
3	IBM Microelectronics	800	5%
4	Chartered	725	49%
5	SMIC	365	630%

Gartner, Digitimes, 2004 9

[2]

	2003	(US\$m)	
Winbond Electronics	889		DRAM, specialty DRAM, pseudo SRAM
Mosel Vitelic	791		LCD driver ICs
ProMOS Technologies	756		Specialty DRAM, pseudo SRAM
Powerchip Semiconductor Corporation	691		Commodity DRAM, specialty DRAM, NAND flash, CMOS image sensors
Macronix International	523		EPROM, NOR flash, SRAM
Vanguard International Semiconductor	328		LCD driver ICs, NOR flash, mask ROM, CMOS image sensors
Episil Technologies	109		Power MOSFETs, linear ICs, LCD driver ICs,
Antek Semiconductor	46		DC-fan driver ICs, EEPROM, CD-ROM driver ICs, DC-DC converter ICs
Advanced Microelectronics Product	37		Power ICs, discrete ICs

) US\$1=NT\$33.25 ,

Digitimes, 2004 9

■

2003 2
IDM
가 2004

SICA(Semiconductor International Capacity Statistics) , 가
2004 1 98% , 2002 1 63% 가

TSMC, UMC,

12 0.13

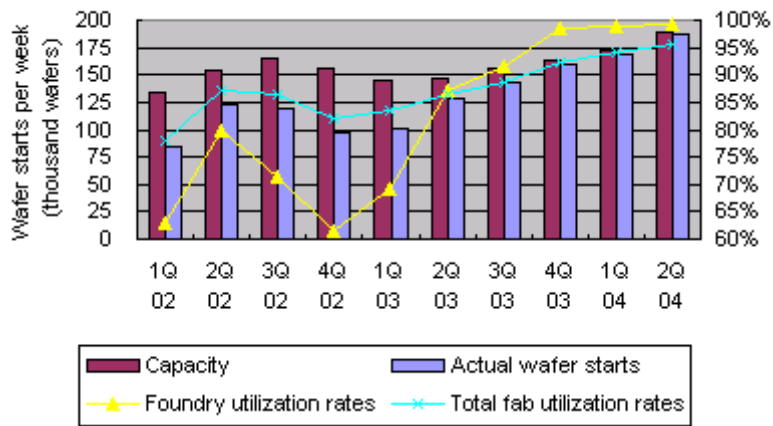
가 , IDM

0.13

0.13

가 30% 가 , 20%

[가]



SICA, Digitimes, 2004 9

F-20

TSMC ,

25% 가 가

8 403,800

67,000

가 32,000

8 2

UMC 2004 70% 12

, 12A 8 500

, UMCi 8 5000 가

. UMC

37.2% 8 258,000

12 가 , 8 62,000 가 , 1

24,000 3 가 . F-20 , 12

62,000 가 UMCi 12 20,000

가

SMIC(Semiconductor Manufacturing International Corporation)

8

58,000 , 8 125,000

2004 20% 12 Fab 4

. Fab 4 8 6,750

(Chartered) 0.18

. 0.18 308,000

461,000 12 Fab 7

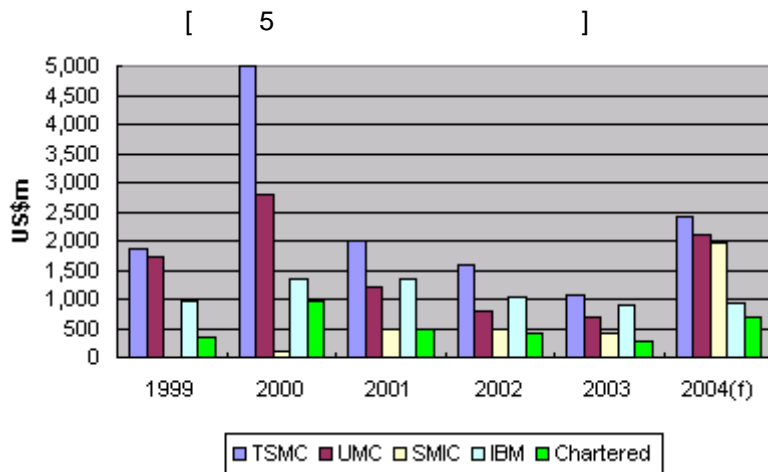
가 2,000 9,000

. 104,000 가 가

108,000

IBM 12 iSuppli 6 18,000 IBM

가 Fab 7



1) UMC UMCi, UMCj

2) SMIC 1999 IC Insights, Digitimes, 2004 9

■

가

가가

가 IC

1 , IP

2003 10 , TSMC

가 가

2003 11 , TSMC

(Kenneth Kin) 가

IC 가 ,
(OmniVision Technology) (VisEra Technology)
IC
TSMC 90
nm 100 1,000 0.13
TSMC 'Cyber Shuttle'
IC
TSMC 3 12
UMC IC
가가 0.25~0.13
IP (free-of-charge silicon-
proven IP libraries)
TSMC UMC LCoS LCoS

[TSMC UMC]

TSMC	eFoundry	
	Design Service Alliance	3 , IP, EDA
	In-house Design Service Division (DSD)	TSMC 0.18 IP
	Cyber Shuttle	
	In-house mask production, packaging and testing services	
UMC	MyUMC	
	Chipsizer	IP
	Silicon Shuttle	
	In-house test and packaging	
	Free of charge IP libraries from 0.25- to 0.13-micron processes	

■

가

2004

, PC,

4, 5, 6

, SMIC, GSMC(Semiconductor Manufacturing Corporation), HHNED(Shanghai Hua Hong
NEC Electronics Co), HJT(He Jian Technology) 8 12 가

SMIC 2 12

4

2006

GSMC

12

2005

2006

HJT

8

12

SMIC

50%

6 30

80,872

124,750

가

, TSMC

UMC가

5

가

TSMC

UMC

TSMC

8

2004

0.25

UMC

HJT가

UMC

가

HJT

TSMC

10, 15%

2004

2005

8

2004

280

, 2005 470

36%, 53%

		(8")		(micron)	
HHNEC	ZHPP	50,000	Q2,99	0.35	Memory DRAM, Flash
		15,000 ¹	Q2,04	0.35 - 0.25	BiCMOS, EEPROM
SMIC	Tainjain	40,000	Q2,01	0.25	Smart MOS, Integrated Logic and Analog
	ZHPP	85,000	Q1,02	0.18	DRAM Embedded SRAM, EEPROM, mixed Signal (CMOS)
	Beijing	112,500 ²	Q4,04	0.11 - 0.09	DRAM and CMOS Logic
GSMC	ZHPP	81,000	Q2,03	0.18	
	ZHPP	60,700 ³	Q2,05	0.18	
ASMC	ZHPS	30,000	Q1,04	0.18	EEPROM, BiCMOS, CMOS
Advanced Device Technology (Nanker)	Zhuhai, Guangdong	20,000 ⁴	2005	0.25	
He Jian Technology	Jiangsu Province	32,000	2004	0.25	Specialty DRAM
	Jiangsu Province	28,000	Q3,03	0.25	
TSMC	SIZS	40,000 (5,000 in 4Q04)	2005	0.25	Foundry CMOS
ProMOS	SIZS	40,000 ⁵	2006	0.25	Foundry, Memory
STMicroelectronics / Hynix	N/A	67,500	2006	0.18	Logic / Memory
Nanotech	Changzhou	20,000	2004	0.25 -0.35	Logic
SIM-BCD	ZHPS	20,000	2006	0.35	BiCMOS

- :
- ZHPP: Zhangjaing Hi-tech Park, Pudong
 - ZHPS: Zhangjinh Hi-Tech Park, Shanghai
 - SIZS: Songjiang Industrial Zone, Shanghai
- 1) empty shell
 2) 12
 3) empty shell, one module forecast to be 12-inch
 4)
 5) 가

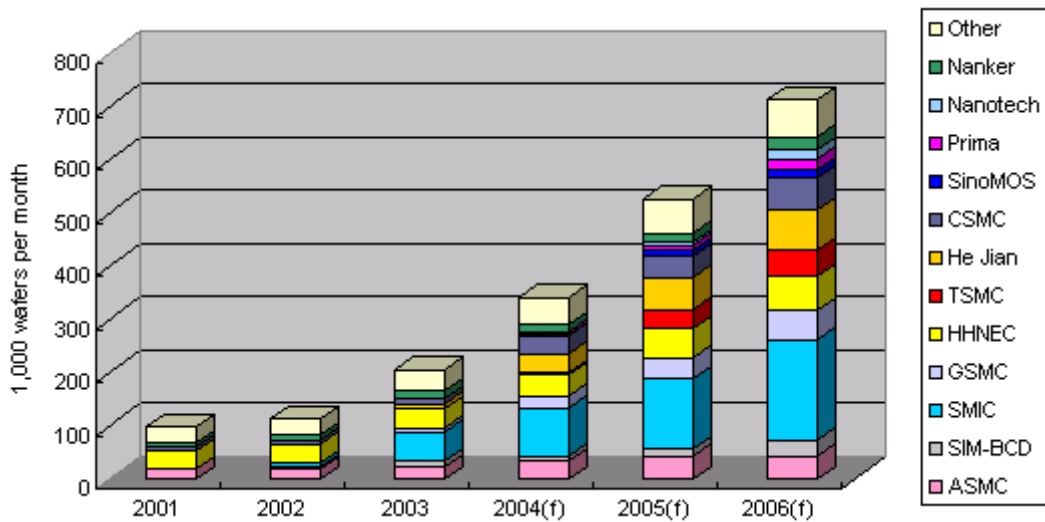
VS - 史

■ , 가

(State Council Circular No. 18, 2000 6 24)

2004 6 6 10 8 2002
 2 6 1 8 8
 2001 97,000 2004 333,000 CAGR 52%

[]



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■ ,
 3 5 (1966-1970) IC
 5 5 (1976-1980) 6 7 5 (1981-1990)
 IC 5 IC
 Shanghai Belling, ASE(Advanced Semiconductor Engineering), Shougang NEC, Huayue Microelectronics

IC 60 70 (Ministry of

Economic Affairs; MOEA)가 IDM IC
 . 1971 IC IC
 OSE(Orient Semiconductor Electronics) 가
 ITRI(Industrial Technology Research Institute) 1973 , 1980
 HSP(Hsinchu Science Park)가 ITRI RCA IC ,
 , , .
 RCA ITRI 1979 1988 UMC, TSMC,
 TMC(Taiwan Mask Corporation) . ITRI IC
 , IC .
 , 가 (Coordinating
 Committee for Multilateral Export Controls; COCOM)

■

1990 908 909
 . 120
 ASMC(Advanced Semiconductor Manufacturing Corporation),
 Shougang NEC, HHNEC(Huahong NEC) ,
 IC . ST
 (STMicroelectronics) Shenzhen SEG(Shenzhen SEG Hi-Tech Industrial)
 Shenzhen STS Microelectronics가 . (Shanghai
 Waigaoqiao Free Trade Zone) , AMD 가

IC 1990 . IC

IC

10 5 (2001-2005) IC

7 IC 가 , 5 5 50%
 , 가 (State Council Circular
 No. 18). 10 5 IC 3~4 6 , 6~7
 8 , 1~2 12 .

IC , 가 ,
 463 10% 0.25
 IC
 IC

[略史]

1965~1973	1974~1984	1984~1988	1989~
- - , - 가 ITRI,	- , - Hsinchu Science-based Industrial Park - ITRI, RCA	- ITRI, UMC - ITRI, IC , TSMC, TMC - ERSO(Ex-electronics Research & Service Organization IC	- - -
▶ ▶	▶ ▶	▶ ▶	▶ ▶
1995~1998	1998~2002	2003~	
- , - Shanghai Ahangjiang High-Tech Park - ST/ ,	- IC , , - SMIC GSMC, - Jiangyin Changiang Electrnic Industrial	- SMIC, CSMC - He Jian, NSSI, TSMC	

DIR, Digitimes, 2004 9

■

. SMIC, HJT(He Jian Technology), ASMC(Advanced Semiconductor Manufacturing Company), HHNEC(Hua Hong NEC), GSMC(Grace Semiconductor Manufacturing Corporation), CSMC, TSMC Shanghai, NSSI(Ningbo Sinomos Semiconductor Inc.), SIM-BCD, Nanker, Prima

SMIC

SMIC 4 8
 12 8 90,000
 12 Fab 5, Fab 6 2006 , 2
 190,000 가 0.13
 90nm 2005 . SMIC , TI, ,
 , (Elpida Memory), (Broadcom), (Datang Microelectronics)

HJT (He Jian Technology)

2 , HJT SMIC 가 .
 UMC 가 .
 8 (Fab 1) 8 35,000 가
 . Fab 2 8 가 12 .
 2006 가 75,000 . HJT
 0.15 가 . 0.13 2005
 , (Novatek Microelectronics),
 (MediaTek), (Shanghai Fudan Microelectronics)

GSMC

GSMC SMIC . GSMC SMIC 2
 , . Fab 1 2 가
 12 . GSMC 8
 , 12 . 8
 22,000 . 12 2006
 , GSMC 8 53,000

GSMC 0.18 2005 0.15 가
 SST(Silicon Storage Technology), (Oki Semiconductor), Agere
 Systems, VIA Technologies,

HHNEC

HHNEC 8 가 DRAM
 IC HHNEC 8
 (Shanghai Belling) 40,000
 2005 8 65,000 HHNEC
 0.18 가 , 2005 (Jazz
 Semiconductor) 0.15
 NEC, SHHIC(Shanghai Hua Hong Integrated Circuit)

ASMC

, 1 5 , 1 6 , 1 8
 8 33,000 2005
 43,000 0.35 가
 2005 0.25
 TI, NS(National Semiconductor), , Shanghai Fudan Microelectronics

CSMC

CSMC 6 가 , 8
 33,000 8 17 IPO ,
 8 . 8 2006 , 가
 CSMC 60,000 . CSMC 0.35
 , Hangzhou Silan Microelectronics,
 Shaoxing Silicore Technology, Wuxi China Resources Semico, China Sigma

[]

							wafer (")	(micron)
가	ASMC	Fab1	SCHIP	Shanghai	1994	25,000	5	1
가		Fab2	SCHIP	Shanghai	1997	15,000	6	0.5
가		Fab3	SCHIP	Shanghai	2003	45,000	8	0.25
가	SIM-BCD	Fab1	SCHIP	Shanghai	2002	20,000	6	1
		Fab2	SCHIP	Shanghai	2006	20,000	8	0.35
가	SMIC	Fab1	SZHP	Shanghai	2001	45,000	8	0.13
가		Fab2	SZHP	Shanghai	2002	45,000	8	0.13
가		Fab3	SZHP	Shanghai	2003	15,000	8	0.13
가		Fab4	BEDA	Beijing	2004	20,000	12	0.09
가		Fab7	-	Tianjin	2001	35,000	8	0.25
가	GSMC	Fab1 Phasel	SZHP	Shanghai	2003	27,000	8	0.15
		Fab1 Phasell	SZHP	Shanghai	2005	20,000	12	0.13
가	HHNEC	Fab1	DJQEZ	Shanghai	1999	35,000	8	0.18
가		Fab2	SZHP	Shanghai	2004	30,000	8	0.25
가	TSMC	Fab10	SSIZ	Shanghai	2004	35,000	8	0.25
가	Shanghai Belling	Fab1	SCHIP	Shanghai	1997	16,000	4	0.8
가	He Jian	Fab1	SIP	Suzhou	2003	32,000	8	0.15
		Fab2	SIP	Suzhou	2005	20,000	12	0.13
가	CSMC	Fab1	WNHIDZ	Wuxi	1998	60,000	6	0.35
		Fab2	WNHIDZ	Wuxi	2005	30,000	8	0.35
가	SinoMOS	Fab1	NFTZ	Ningbo	2004	30,000	6	0.5
가	Prima	Fab1	CETIP	Changzhou	2004	20,000	8	0.35
	Nanotech	Fab1	-	Changzhou	2005	18,000	8	0.25
가	Nanker	Fab1	-	Zhuhai	2000	25,000	6	0.5
		Fab2	-	Zhuhai	2005	20,000	8	0.25
가	Shilan Micro	Fab1	-	Hangzhou	2003	15,000	6	0.5

)

:

- SCHIP: Shanghai Caohejing High-Tech Industrial Park

- SZHP: Shanghai Zhangjiang Hi-Tech Park
- BEDA: Beijing Economic-technological Development Area
- DJQEZ: Dong Jin Qiao Export Zone
- SSIZ: Shanghai Songjiang Industrial Zone
- SIP: Suzhou Industrial Park
- WNHIDZ: Wuxi National Hi-Tech Industrial Development Zone
- NFTZ: Ningbo Free Trade Zone
- CETIP: Changzhou Electronics Technology Industrial Park

Digitimes, 2004 9

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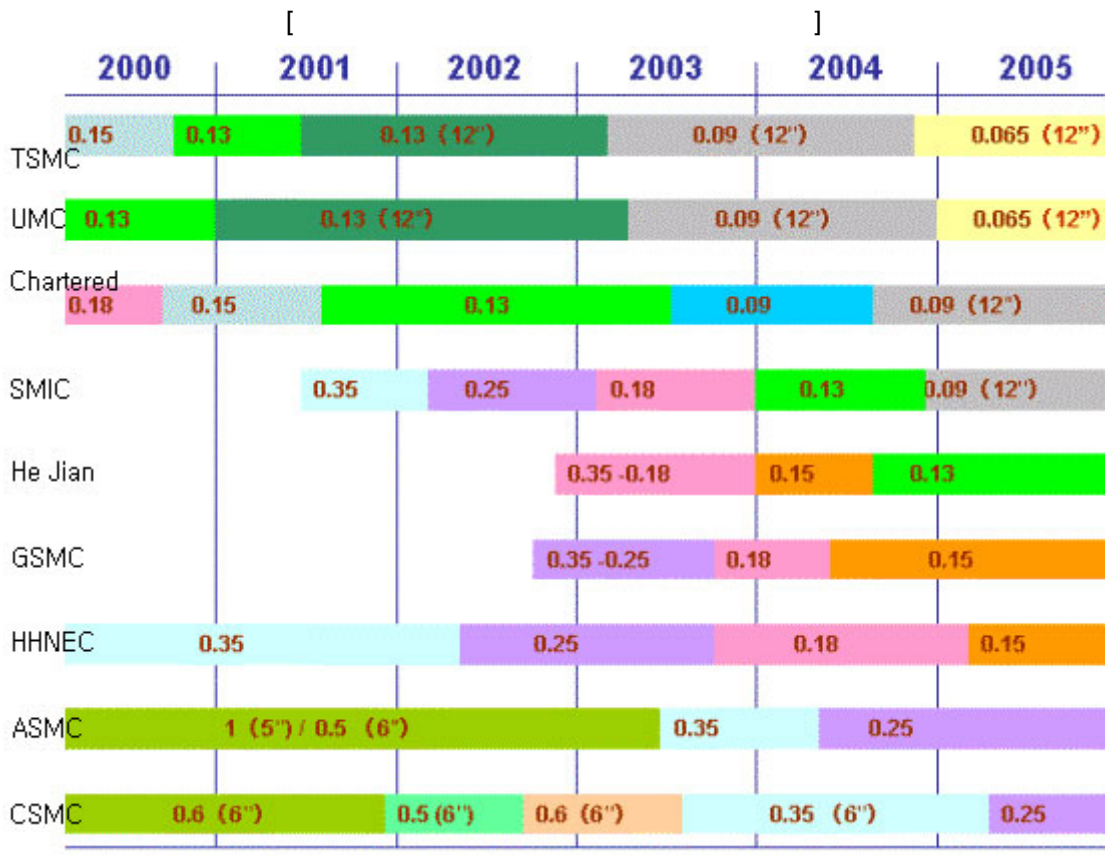
SMIC IPO가 2004 3 , 가
 가 , ' 10
 .

1994 TSMC UMC 0.35 6 IC
 가 ASMC 5 3.0
 . 1997 TSMC UMC 0.25 8
 , ASMC 6 0.80
 .

1999 TSMC UMC 0.18 8 ASMC
 HHNEC 0.35 8
 HHNEC DRAM IC
 .

2001 , 0.15 , 12
 가 SMIC
 0.25 .

2003 TSMC UMC 90nm SMIC 0.13
 (copper interconnect)



) 가 8
Digitimes, 2004 9

■

SMIC가 ? 가 가 .
 SMIC 3 , , , , SMIC
 가 R&D , SMIC 0.11, 0.10 TSMC UMC
 IC .
 SMIC가 , SMIC가
 R&D . UMC John Hsuan
 5 19 . "SMIC GSMC 가 ."
 UMC가 9% R&D , SMIC
 90%

가 . TSMC UMC 2004 15%, 8.8%

R&D 가 SMIC 4.5%

가 .

■ -

Texas Instruments, 0.25~0.13

TI, , , , , NEC

50 8

40,000

2004 4 1 2 , 15

0.35~0.13 50,000

0.13 90nm

40,000 50,000 , 2006 90nm

70,000

. 2006 10

213

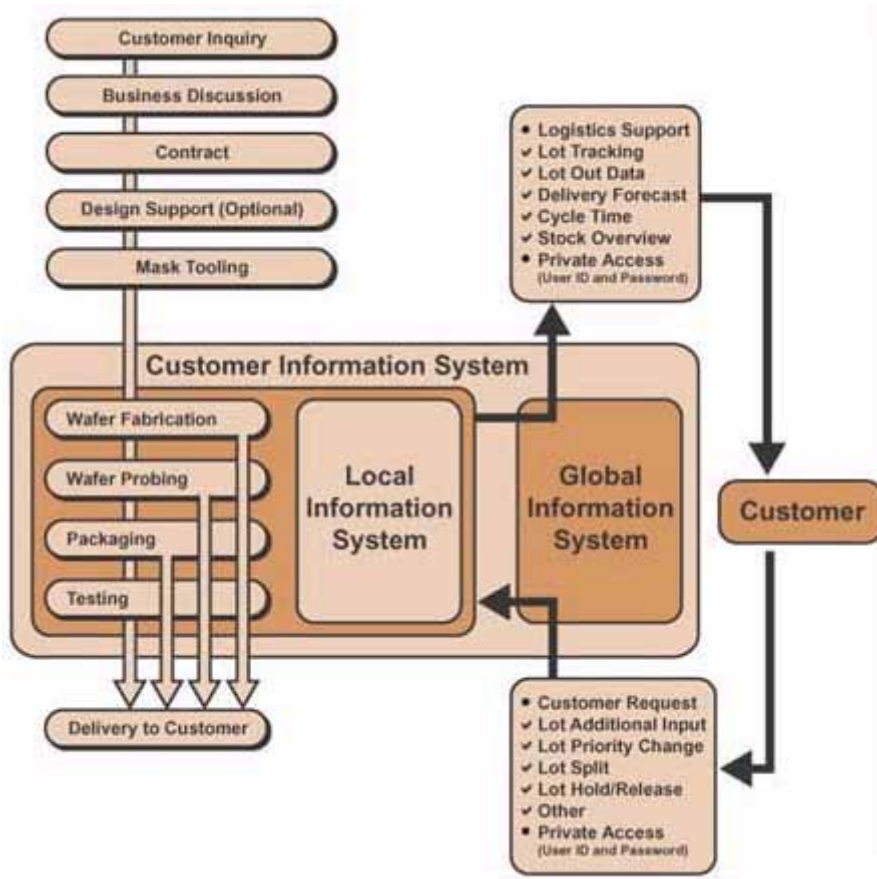
2015 30 7

가 .

, ShttleChip

, YourFAB

[]



■ IDM -

가

IDM

가

가

12

7,000

, 12

700

가

5~10%

가

82,000

(High Voltage), Embedded
, EEPROM)

(0.25 0.18μm
SoC(System on Chip)

, 0.25 0.18μm D
ASIC()

가가

ASIC

Logic

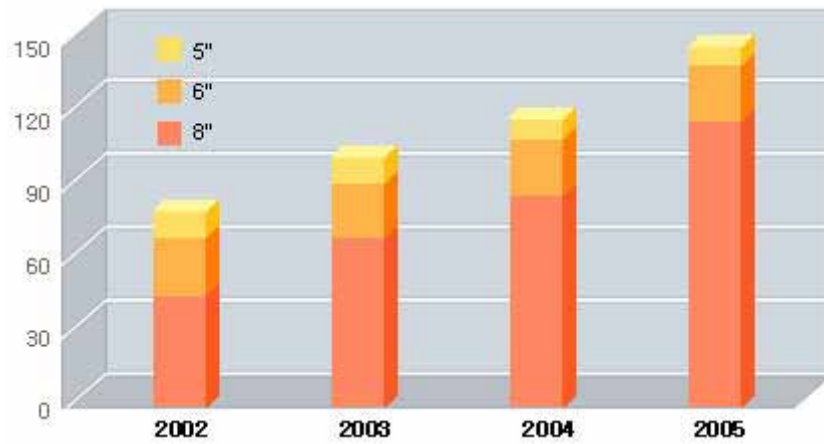
DRAM

가

가 가

SOC

[(8 , : 1,000)]



■

DRAM

1994

4

가

[가 (2002)]

가		
	5.8%(91)	1.2% (19)
	5.1%	45.5%
	3.6%	22.8%
EU	1.9%	9.5%

가 ,
 IT
 IT
 CDMA
 (Qualcomm) TSMC, UMC 가 ,
 가 가 .
 60% , 50% 가 ,
 12 가 ,
 가 .
 ■
 8
 1000
 100
 TV XD DNle
 가 , TV
 SoC

가

. SoC

가

SEMICON TAIWAN 2004