



## TSMC 0.18, 0.13 $\mu\text{m}$ - 90, 65, 40, 28 & 16 nm PROTOTYPING AND VOLUME PRODUCTION

Picture: Taiwan Semiconductor Manufacturing Co., Ltd.

**EUROPRACTICE-IC offers TSMC Multi-Project-Wafer and Volume Production services in deep submicron CMOS technologies to both academic and private sectors.**

### Why EUROPRACTICE?

- ▶ Affordable and easy access to Prototyping and Small Volume Production services for academia and industry.
- ▶ MPW (Multi-Project-Wafer) runs for various technologies, including ASICs, Photonics, MEMS and GaN.
- ▶ Advanced packaging, system integration solutions and test services.

### Why TSMC?

- ▶ Semiconductor technology leader with fabs in Taiwan, the US and China.
- ▶ Committed foundry providing record lead times for all technologies.
- ▶ Complete in-house library ecosystem together with a fully equipped and easy to install PDK.
- ▶ Flexible block sizes for MPW, including Microblock and mini@sic solutions.

### Technology Highlights

#### 0.18 $\mu\text{m}$

TSMC's 0.18 $\mu\text{m}$  is a well-proven and mature technology, fully supported with an extensive IP ecosystem. Through the years, it has been a platform for More than Moore additions, such as HV and NVM. Moreover, this affordable technology has good RF capabilities, e.g., Bluetooth, RFID, IoT and Zigbee. These features make it an excellent platform for educational purposes and low-cost solutions. The TSMC 0.18 $\mu\text{m}$  process drives a wide spectrum of applications: mobile phones, wireless communication, tablets, Bluetooth devices, gaming products and portable consumer electronics. EUROPRACTICE has a very broad MPW offer in 0.18 $\mu\text{m}$  for all its flavours, including a HV BCD process. The offer is complemented with up to three mini@sic runs per year.

#### 0.13 $\mu\text{m}$

TSMC's 0.13 $\mu\text{m}$  is a cost-effective technology with a copper backend. It is available as 8- or 12-inch process with bumping service offered for the 12-inch option. This is the new platform for the next generation high voltage technology. Today, it sees broad application in consumer electronics, computers, mobile computing, automotive electronics, IoT and smart wearables.

#### 65 nm

The TSMC 65nm technology offers better integration and improved chip performance compared to the 90nm process. It is a very cost-effective mainstream technology that includes MOM capacitors with high area efficiency and optional bumping service. The 65nm process supports a wide range of applications, such as mobile devices, computers, automotive electronics, IoT and smart wearables. It is particularly suitable for RF applications with an FT of 160GHz. MTP and OTP low-cost solutions are available through eMemory for academic institutions. The 65nm process is well supported by MPW runs, including four mini@sic runs per year.

## 40 nm

The 40nm process integrates 193nm immersion lithography technology and ultra-low-k interconnection technology to increase chip performance, while simultaneously lowering power consumption. It is also a platform that will have extensions in the future, e.g., HV and NVM. In addition, TSMC has a large standard cell library offer (multi VT and gate lengths) for power optimization. The 40nm GP process technology aims for high performance applications, namely CPUs, GPUs, game consoles, networks, FPGAs and hard disk drives. At the same time, the 40nm LP process targets smartphones, digital television (DTV), Set-Top-Box, game and wireless connectivity applications.

## 28 nm

The TSMC 28nm process offers new design methodologies compared to the 40nm technology. It allows to deliver higher performance, save more energy and design eco-friendlier products. Using high-k metal gate and providing multi pitch libraries, the 28nm technology is the most performant pla-

nar mainstream solution that evolved through the years due to constant enhancements in the manufacturing process. It supports a wide range of applications, including CPUs, GPUs, high-speed networking chips, smart phones, APs, tablets, home entertainment, consumer electronics, automotive and IoT. Moreover, the 28nm RF (28HPC+ RF) technology provides support for 110GHz mmWave and for 5G mmWave RF. EURO PRACTICE offers its customers access to general MPW runs together with mini@sic and Microblock options

## 16 nm

The 16nm technology is the first FinFet solution offered by TSMC. EURO PRACTICE has recently extended its portfolio by including this flagship technology, i.e. TSMC 16nm CMOS logic Fin-Fet Compact 0.8V/1.8V. It provides superior performance and power consumption advantage for next generation high-end mobile computing, network communication, consumer and automotive electronic applications.

Since it is classified as a leading node technology, access to TSMC 16nm is subject to review and approval by TSMC.

## Technology Details

0.18μ G MS/RF	0.13μ G MS/RF	90nm LP and G MS/RF	65nm LP and G MS/RF
Nominal, Medium, Native VT Hipo resistor MOM Capacitor M3 - M6 Al Triple well Ultra thick metal (1.8/3.3V)	SVT, HVT, LVT, native Hipo resistor MIM Capacitor M3 - M8 Cu Triple Well Ultra thick metal (1.2V) (2.5 or 3.3V I/O)	SVT, HVT, LVT, ULVT, native MIM Capacitor + MOM M3 - M9 Cu Triple Well Ultra thick metal LP (1.2V) (2.5 or 3.3V I/O) G (1.0V) (1.8 or 2.5V or 3.3V I/O)	HVT, SVT, LVT, Native, M-Low VT Unsilicided PO resistors MIM Capacitor M3 - M9 Cu Triple well Ultra thick metal LP (1.2V) (2.5, 3.3 I/O) G (1.0V) (2.5, 3.3) I/O
40nm LP and G MS/RF	28nm CMOS RF HPC (+) *	28nm CMOS RF HPL *	16nm CMOS Logic FinFet *
HVT, SVT, LVT, native N-WELL, OD, Poly resistor MOM Capacitor M3-M10 ELK Cu Triple well Ultra thick metal LP (1.1V) (1.8V, 2.5V I/O) G (0.9V) (IO 1.8V, 2.5V I/O)	ULVT, LVT, SVT, HVT, Extreme HVT NW, OD, High-R resistor MOM capacitor M10 Triple well, Deep N-Well in option Ultra thick metal 0.9V core 1.8V I/O, 2.5V I/O	Extreme LVT, ULVT, LVT, SVT, HVT NW, OD, High-R resistor MOM capacitor M10 Triple well, Deep N-Well in option Ultra thick metal 1.0V core 1.8V I/O, 2.5V I/O	Low Noise VT, ULVT, LVT, SVT, HVT TiN High Resistor HD MIM capacitors M6 to M13 ELK Cu Last metal level in Al pad Triple well, Deep N-Well in option 0.8V core 1.8V I/O

\* These technologies are available only upon approval of TSMC