

TSMC utilization rate increased with
12nm/ 7nm/ 5nm strong demand,
July production increased 8%

July, 18th, 2020



Kingdom Wide Corp Research

TSMC PRODUCTION UPDATE

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- TSMC June revenue increase is attributed to 28/22nm (+12%), 16/12nm (8%), 7nm (1%) and include early shipment of 5nm chips.
- 28/22nm: WLANIC players (Qualcomm, Avago MediaTek, Realtek, and etc.) are migrating WLANIC from 40nm to 28/22nm.
- 16nm/12: MediaTek has increased wafer shipment amount for mid/ low level smart phone.
- 7nm: Huawei is building up 7nm (DUV) and 7nm+ (EUV) nodes for the Kirin 980, Kirin 990 4G, Kirin 985 4G and Kirin 990 5G. MediaTek, Qualcomm, AMD, NVidia are all increase wafer demand for 7nm.
- 5nm: KWC expects 5nm early shipment chips for Apple and Huawei.
- TSMC top ranking customers are increasing advanced nodes' capacity plan which will give TSMC great momentum for 2H20

Taiwan Semiconductor Manufacturing Company (TSMC) saw its June revenue climb to a record high of NT\$120.88 billion (US\$4.1 billion), rising 28.8% sequentially and 40.8% on year. Revenue for the first half of the year totaled NT\$621.3 billion, gaining 35.2% from a year earlier. TSMC posted revenue of about NT\$310.7 billion in the second quarter, up 25.2% from the same period in 2019. TSMC official feedback for Huawei ban, Kingdom Wide Corp has adjusted Huawei forecast down to "0%" in year 2021. MediaTek is widely cooperating with TSMC for 5G related markets, expects the ratio will increase from 2020 5% to 2021 8% of TSMC revenue. TSMC revised up its Y2020 Capex by \$1bn with the strong demand of 5G and HPC despite the macro headwinds. Based on KWC forecast, we believe TSMC may already have the sign to grow robustly in the following quarters. **From the supply side:** TSMC may keep pulling in 5nm process tools and further expand its 5nm capacity from 50K/m to 55~60K/m in 2H020. Moreover, we see TSMC may have potential growth in 5nm process owing to the high utilization rate for R&D purpose. **From the demand side:** NVidia and AMD may not ramp up quickly in TSMC's 5nm process in the following quarters, there are still two candidates to make up the 5nm capacity. **Apple non-AP product:** we check that Apple's non-iPhone demand may be the one of the next candidates to backfill 5nm capacity since 2H20. **Application Processor:** Qualcomm's SDM875+ may come into TSMC's 5nm earlier than expected to back up the SDM875 with 5~10K wafers per month in 4Q20. Although TSMC may inevitably encounter some short-term impact under the US ban, we still think it may keep growing thanks to the robust orders from its top two customers – Apple and Qualcomm.

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TSMC 5nm utilization rate is quite high and expects Apple will have 5nm capacity 40~45K per month in 1Q21, besides A14, A14X, and MacBook's chipset, Apple's server CPU may start in TSMC 5nm by 1Q21. Kingdom Wide Corp believes TSMC 5nm may still have other customers after stopping Hisilicon products beyond Sep. 15th, such as Qualcomm's SDM875+ with 5~10K wafers per months in 4Q20 as back up of the Samsung SDM875. Furthermore, MediaTek D2000 may start risk production with TSMC 5nm by 4Q20 as well, other than risk production project, the R&D projects with others customers (i.e. AMD, Altera, Bitman, etc.) are potential growth moment for TSMC advanced node revenues.

Node	2018				2019				2020			
	1Q'18	2Q'18	3Q'18	4Q'18	1Q'19	2Q'19	3Q'19	4Q'19	1Q'20	2Q'20	3Q'20F	4Q'20F
5nm	-	-	-	-	-	-	-	-	-	100%	131%	121%
7nm/ 6nm	-	-	100%	92%	75%	116%	124%	124%	121%	123%	123%	123%
16/12nm	100%	103%	97%	88%	85%	87%	102%	103%	92%	101%	100%	100%
28/22nm	100%	103%	112%	99%	86%	93%	112%	118%	116%	128%	143%	142%

Table1: TSMC 28nm and beyond normalized QoQ utilization rate

Fab Name	Location	Technology	Wafer size	Maximum Capacity Wafers/ Month
Fab 3	Hsinchu, Taiwan	0.15, 0.13 micron	8-inch	100,000
Fab 5	Hsinchu, Taiwan	0.35, 0.25, 0.18 micron	8-inch	55,000
Fab 6 P1 & P2	Tainan, Taiwan	0.18, 0.15, 0.13 micron	8-inch	180,000
Fab 8	Hsinchu, Taiwan	0.18, 0.15, 0.13 micron	8-inch	95,000
WaferTech	Camus, Washington	0.35, 0.25, 0.18, 0.15 micron	8-inch	36,000
Fab 10	Shanghai, China	0.35, - 0.13 micron	8-inch	120,000
SSMC (Fab 11)	Singapore	0.25, 0.18, 0.15 micron	8-inch	40,000
Fab 12 P1 - P7	Hsinchu, Taiwan	90nm to 7nm	12-inch	180,000
Fab 14 P1 - P7	Tainan, Taiwan	90nm to 12nm	12-inch	200,000
Fab 15 P1 - P7	Taichung, Taiwan	40nm, 28nm, 7nm	12-inch	120,000
Fab 16 P1, P2	Nanjing, China	16nm	12-inch	60,000
Fab 18 P1, P2, P3	Tainan (STSP), Taiwan	5nm	12-inch	120,000
Fab 19	Tainan, Taiwan	3nm	12-inch	30,000

Table2: TSMC Fabs, capacity and technology nodes reference table

Kingdom Wide Corp Research foundry Fab utilization rate model description

To achieve trustable foundry Fab utilization rate which requires analyst to make their predictions with monitoring semiconductor material consumption rates, bottleneck process wafer per day and adjusting estimate utilization rate with their work experiences in foundry operations. Kingdom Wide Corp Research has innovated multiple tracking methods which we believe providing insights into utilization rate trends at various fabs. By analyzing and cross tracking multiple supplies of critical/ bottleneck semiconductor process materials (such as CMP slurry, lithography photoresist, developers, solvents, epitaxy gases, etchants, etc.) that are dispensed on wafer basis, our analysts have created internal analysis methods/ models that we have confidence in making best guesses of foundry fab utilization rate trends for multiple Fabs and technologies mentioned.

To be notice that the assumptions to be considered in our analysis is not only the semiconductor material consumption depending on the manufacturing technology nodes, product application and must-have process equipment, but also semiconductor materials existing different expiration date and safe day of inventory for critical semiconductor materials. Furthermore, the different technology nodes with their own manufacturing cycle time, e.g. 8 inches 6~8 weeks and advanced 12 inches 8~12 weeks, assemble/ testing cycle time at client side and client's DoI forecasts with various production applications. The foundry Fab utilization rate will have delayed for their quarterly revenues disclosure, our analysts can help our customers to have in depth analysis and provide more accreted research information/ reports.

Kingdom Wide Corp Research is open to discuss our foundry Fab utilization rate model and assumptions with customers interested in more detail about our analysis.

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Analyst disclosure

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