Doing obvious & simple things better

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15th of November 2018

Question: how many chips are expected to be produced in 2018?

A. 1,000,000,000 (1 billion) chips

B. 10,000,000,000 (10 billion) chips

C. 100,000,000,000 (100 billion) chips

D. 1,000,000,000,000 (1 trillion) chips

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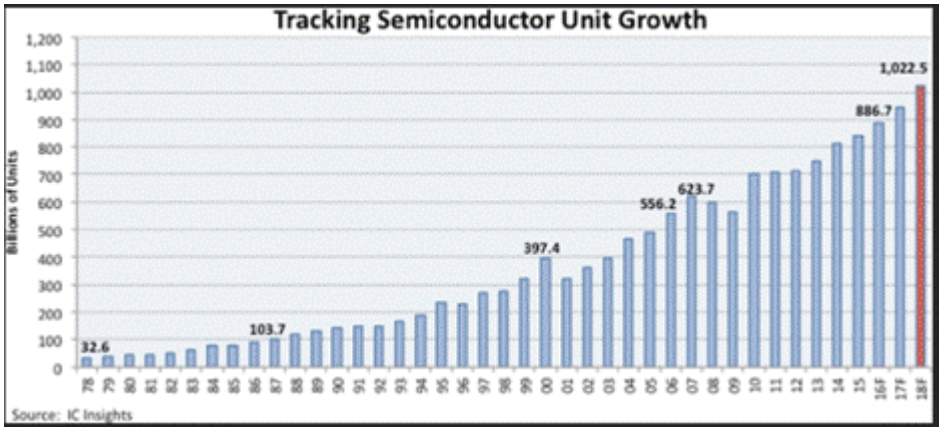


130 chips for each man, woman and child on earth

Source: 2016 edition of The McClean Report—A Complete Analysis and Forecast of the Integrated Circuit Industry

ASML makes the machines for making those chips

- Lithography is the critical tool for producing chips
- All of the world's top chip makers are our customers

A chip is made of dozens of layers

Since 1984, ASML developed multiple generations lithography systems

End of service | Mature Products | DUV | EUV

1984:
PAS 2000

1989:
PAS 5000

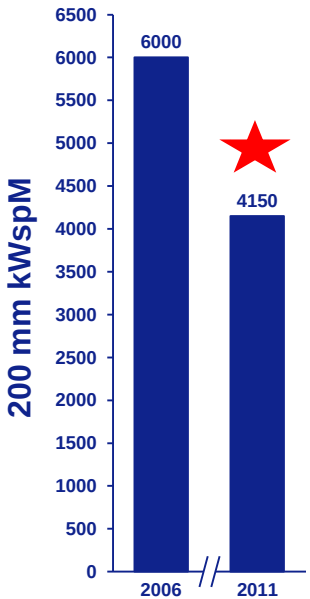
1990-2005:
PAS 5500
Steppers/Scanners

2000- present:
TWINSCAN

2010- present:
NXE EUV systems

Wafer size (200→300mm), throughput increase, resolution improvement

We noticed a steady decline in 200mm wafer starts between 2006 and 2011



- Introduction of 300mm technology led to decline in 200mm wafer starts.
  - Customers transitioned their high volume products to 300mm
- This triggered ASML to declare the end-of-service roadmap by 2022 for its mature systems

Source: SEMI WFF February 2018 update , SUMCO 3Q2017

Question: how many chips does an iPhone X contain?

A. 5 chips

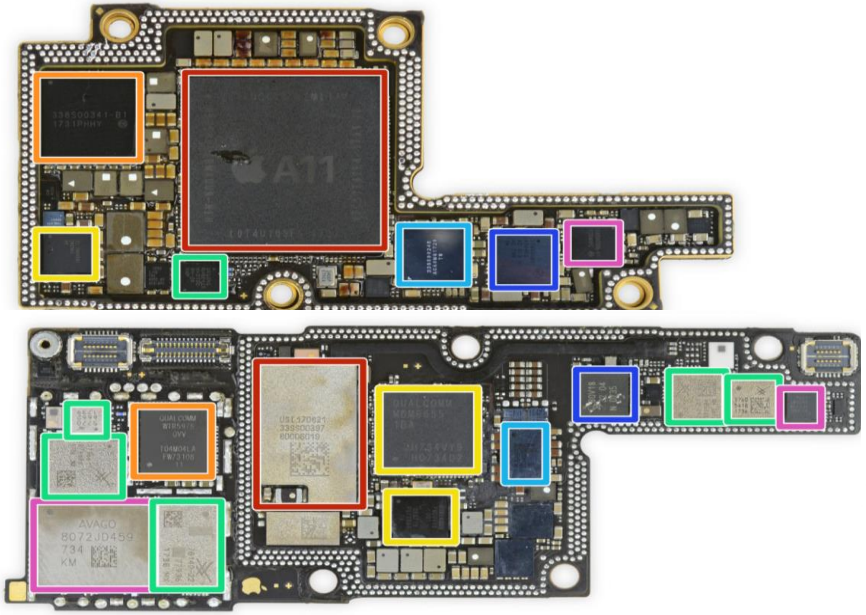
B. 10 chips

C. 20 chips

D. 50 chips

An iPhone X contains 20 chips, of which 18 are produced on 200mm wafers (our mature products)

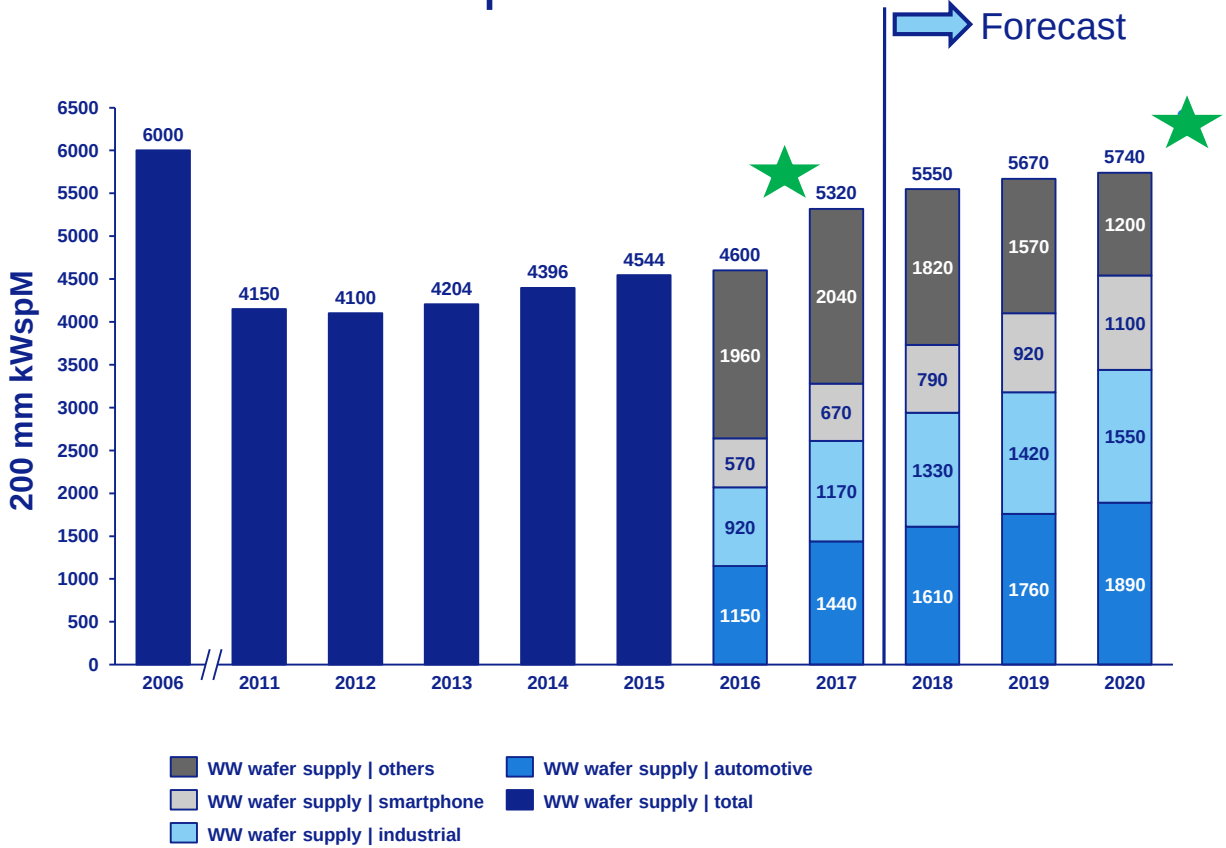
iPhone X Teardown*



- Apple ~~APL1W72~~ A11 Bionic SoC layered over SK Hynix H9HKNNNDBMAUUR 3 GB LPDDR4x RAM
- Apple 338S00341-B1
- TI 78AVZ81
- NXP 1612A1—Likely an iteration of the 1610 tristar IC
- Apple 338S00248 audio codec
- STB600B0
- Apple 338S00306 power management IC
- Apple USI 170821 339S00397 WiFi / Bluetooth module
- Qualcomm WTR5975 gigabit LTE transceiver.
- Qualcomm MDM9655 Snapdragon X16 LTE modem and PMD9655 PMIC. But Apple is dual-sourcing the modem, and TechInsights found an Intel XMM7480 (PMB9948) in their A1901 model. Even though the modem is capable of it, Apple isn't supporting Gigabit speeds with the Qualcomm part.
- Skyworks 78140-22 power amplifier, SKY77366-17 power amplifier, S770 6662, 3760 5418 1736
- Broadcom BCM59355 touch controller
- NXP 80V18 PN80V NFC controller module
- Broadcom AFEM-8072, MMMB power amplifier module

Source: ifixit.com

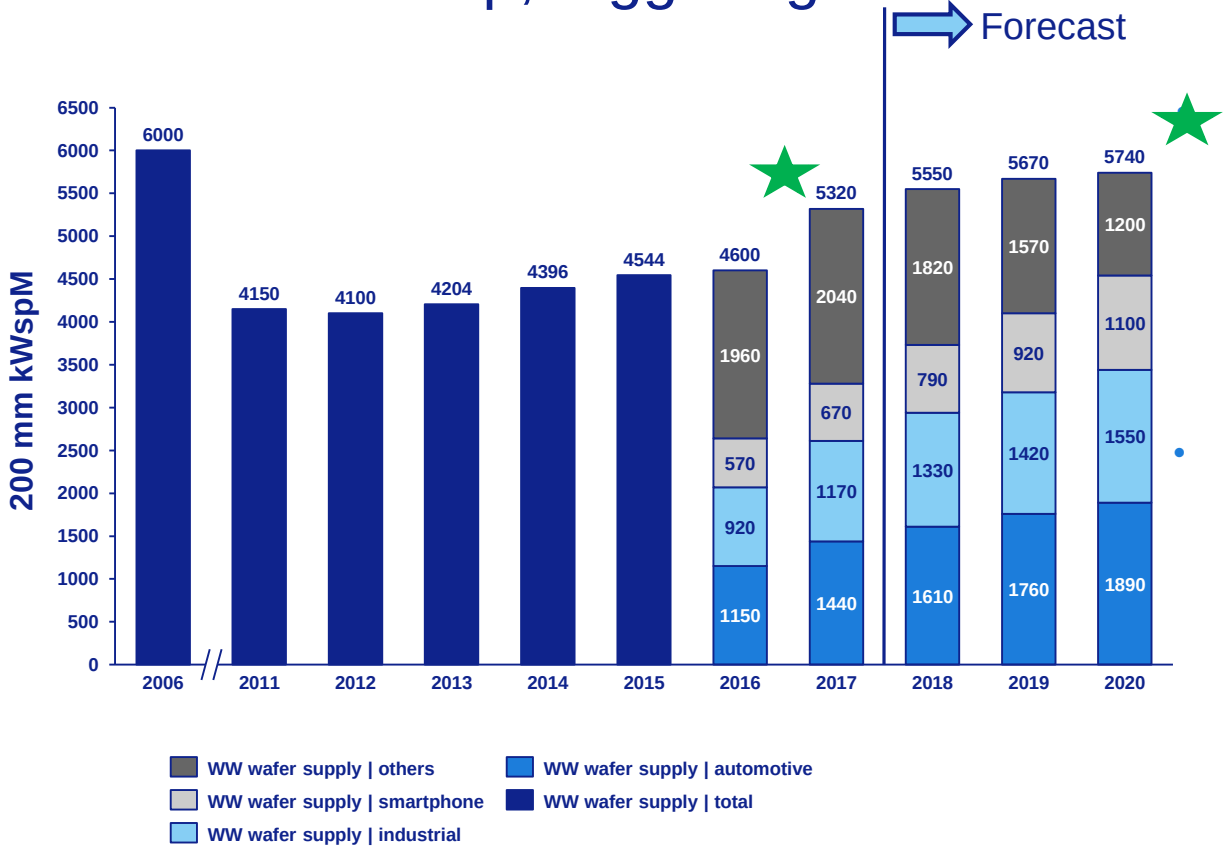
Growing customer demand resulted in extension of our service roadmap



Triggered by the growth in automotive, smartphones and industrial applications, we extended our service roadmap to 2030

Source: SEMI WFF February 2018 update , SUMCO 3Q2017

Growing customer demand resulted in extension of our service roadmap, triggering a revision of our supply chain



Triggered by the growth in automotive, smartphones and industrial applications, we extended our service roadmap to 2030

- **In order to retain and best serve our customers, we want to assure our supply chain is "future-proof"**

Source: SEMI WFF February 2018 update , SUMCO 3Q2017

We discovered several mismatches in our supply chain set-up with regard to customer & engineers' expectations

Product offering

PARTS SHIPMENT LEAD TIMES*:

- STANDARD SHIPMENT = Typical between fourteen (14) - ninety (90) days
- PRIORITY SHIPMENT = ≤2 business days for parts stocked continentally & ≤5 business days for parts not stocked continentally

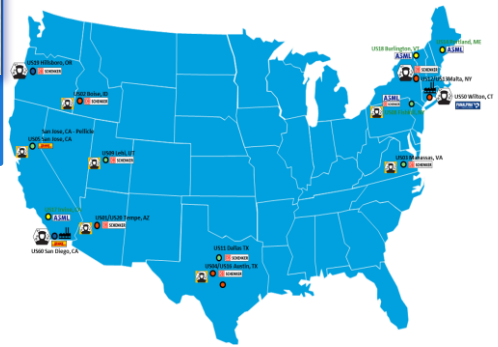
Unclarity on lead-times in our Terms & Conditions

Ordering process and communication

Complex & time-consuming order process

Customer and engineers complaining about long lead-times and unclarity on ETA

Supply chain set-up



Scattered infrastructure with too many intra-local shipments

Result: frustrated customers & engineers, while operating a costly supply chain

We took an end-to-end approach in turning around our supply chain

Product offering

- Lead-time commitment based on customer requirements and standard practice at 3PL
- Deliver >96% of all demand within 3 business days
- Late cut-off times and early A.M next day delivery if needed
- Add-on services on top

Ordering process & communication

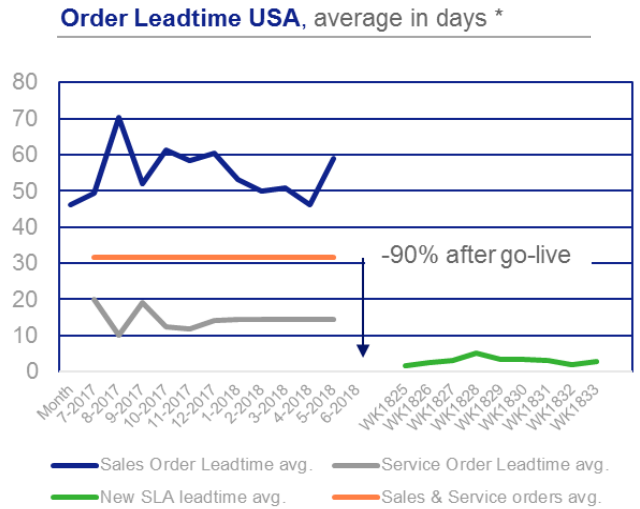
- Easy ordering, any place / any time
- Customer specific pricing and conditions
- Order status and history
- Communication of ETA
- Secure login via 2-factor-authentication

Supply chain set-up

- Consolidation of inventory and plan for all demand
- From complex order allocation to FIFO
- Logistics supplier responsible for order intake, warehousing and freight
- Optimized internal processes; automation and standardization
- Lean organization

Results: lead times & costs have come down, customer satisfaction increased

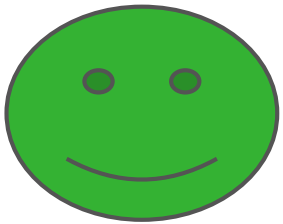
Results: order lead time & cost



~24% cost reductions (freight, warehousing and headcount)

Results: improved customer satisfaction

- Customer quote: *"This is really good. We ordered a part in your portal at 5.30 p.m. and it is scheduled to early a.m. delivery tomorrow"*

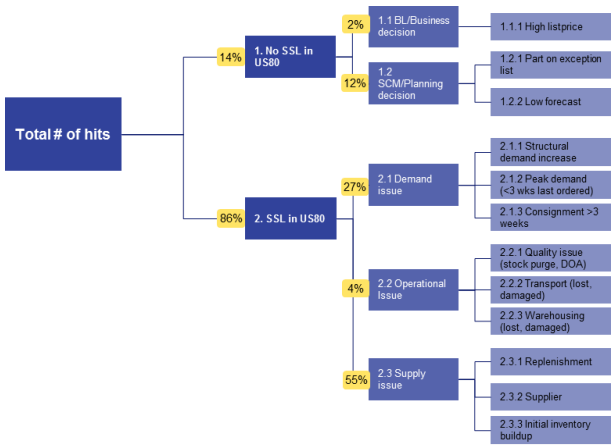


- Engineer quote: *"yesterday we ordered a part for a system down at a customer in Canada. The part arrived today. This never happened before and will help us win back business!"*

In case lead-times are not met, we learn from our mistakes. We will globally roll-out this new approach

Closed learning-loop

- 100% root-cause analysis of late deliveries, including follow-up actions to mitigate risks



Next steps

- Enhance web-portal functionalities (e.g. customer pre-paid balance and easy returns processing)
- Roll-out in EU H1 2019
- Roll-out in Asia H2 2019

Lessons learned; why did it take 1.5 years to implement such an apparently simple supply chain concept?

1. When 99% of ASML is focused on introduction of new lithography systems and keeping them running at all cost, it becomes a challenge to change general supporting processes

2. Coming from a complex set-up; the easier the solution you want to implement, the more processes you have to deal with

3. Our ambition of outsourcing activities is larger then what we have now outsourced. We need to further standardize our processes and then see if this matches the scope of our logistics partner

To be continued….

ASML