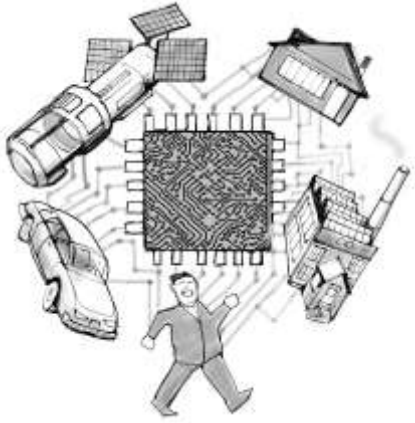
BRYAN, GARNIER & CO

BG TMT Club

April 16



Semiconductors

MWC16… from another perspective

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Bryan Garnier | Semiconductor coverage

A vertical approach

From small to large European semiconductor players
with different profiles and implications in several end-markets.

Company name	ARM Holdings	ASML	Dialog Semi.	Infineon	STM	Soitec
Recommendation	**Buy**	**Buy**	**Buy**	**Buy**	**Neutral**	**Neutral**
Fair Value	**1,310 p**	**EUR 85**	**EUR 40**	**EUR 15**	**EUR 7**	**EUR 0.50**
Stock Price	1002 p	EUR 86.5	EUR 32.5	EUR 12.3	EUR 4.9	EUR 0.59
Upside / Downside	+31%	-2%	+23%	+22%	+43%	-15.3%
Market Capitalisation	GBP 14.2 Bn	EUR 37.5 Bn	EUR 2.5 Bn	EUR 13.9 Bn	EUR 4.5 Bn	EUR 136 m
Profile	IP Vendor	Equipment Manufacturer	Fabless	IDM	IDM	Materials

MWC 2016 | Highlights

Global System for Mobile communication Association:

800 operators + **250** mobile comp. = **GSMA** → **MWC** Created by GSMA in 1987

Today, MWC is…

101,000 attendees

of which more than 5,000 CEOs from the largest companies around the world.

2,200 companies

such as Alcatel-Lucent, AT&T, Bosch, Deutsche Telekom, Ericsson, Ford, Google, Huawei, Intel, Lenovo, Microsoft, NEC, Nokia, Qualcomm, Samsung, SK Telecom, Sony, Telefonica, VMWare, Vodafone and ZTE.

MWC 2016 | Obviously, it is about smartphones

MWC is obviously the perfect event to showcase new smartphones

This year, notable new models are		
 Samsung Galaxy S7	 LG G5	 HTC Desire 825
 Huawei Mate 8	 Alcatel One Touch Idol 4	 Sony Xperia XA

MWC 2016 | Beyond smartphones

3 Key topics

Automobile

The topic was almost omnipresent at MWC16. As a result, we saw companies such as Volvo, Ford, Seat or Nissan being part of demos on behalf of the usual players such as Nokia, Samsung, Ericsson, Qualcomm, NXP or Infineon.

5G Infrastructure

This was probably the main topic at MWC16. Virtually all companies had demos of a technology enabling or working with 5G. From telecom operators Orange to network equipment manufacturers.

IoT Security

While MWC15 was submerged by wearable devices, it looks like security is a new focus for IoT devices manufacturers, connectivity providers and cloud services.

Topic #1 | Automobile

Automobile

Automobile | MWC 2016 showcases

FORD: At MWC16, CEO said the group is now an automotive manufacturer and a **provider of mobility services**

- Ford tries to avoid being dependent on any technology companies.
- Presented **Sync 3**, a homemade embedded operating system with AppLink technology.

SEAT: Announced a **partnership with SAP and Samsung** to develop a connected car project

- Aims to create a **closer link between smartphones and cars** to expand service offering.
- Examples: Book and pay a parking space or transfer authorisation of the car from phone to phone by **creating a virtual copy of the car's digital key.**

VOLVO: was part of the **Ericsson booth with two concepts** close to manufacturing

- One demo showed a similar functionality to the one Seat introduced, i.e. the **digital key feature.**
- Volvo also uses digital keys to **identify** the driver and **serve personalised contents** such as radio, seat position or films during autonomous driving sessions.

BMW: introduced a « **Crowdcell** » feature for BMW cars

- Last year, BMW showcased a car which was able to create a **Wi-Fi connection** to be used by passengers.
- This year BMW introduced **Crowdcell,** allowing **cars to become a 4G hotspot** and improve traditional mobile coverage.

NISSAN: Used MWC 2016 to unveil its latest **Nissan Leaf model**.

- This model is a fully electric car using the NissanConnect EV telematics system providing a suite of digital alerts and **remote access features**, owners can remotely manage and check the status of the battery, set timers for charging, remotely switch on climate control and find local charging stations.

Automobile | MWC 2016, everyone is getting closer

Automotive makers drive the electronic market and electronic players connect to the automotive market

SAMSUNG: Introduced « **Connect Auto** »

- A dongle to be plugged into a OBD port.
- A simple way to make most cars « connected ». Provide **statistics** about the car and **driver habits**, **4G and Wi-Fi connection** in the car, a **« Find my car » service**…

QUALCOMM: A new Qualcomm **Snapdragon 820A dedicated to Automotive**

- Aims to provide an **interchangeable box** with the **latest processor** (upgradable).
- The processor may power the **multimedia** feature and also **ADAS** (Advanced driver assistance sys.) capabilities.

STMICROELECTRONICS: Sets **focus on Smart Driving**

- Focused on Smart Driving during its investor presentation.
- The group has a strong position in **Infotainment** and **Radars** (#1 in ADAS) but is willing to reinforce its offering and benefit from the **additional opportunities of the Connected Auto** (~USD1.4bn in 2020e).

NXP: **Most of its booth** was about Automotive at MWC 2016 with more than **60 Auto chips exposed**

- Showcased Radar chips, Led drivers, vision processing chips, V2X systems, 32bits MCUs, Infotainment systems, Audio amplifiers, Ethernet controllers, and sensors such as steering, wiper control, ABS, and engine control.
- The group also presented an electric Motorbike: Storm Pulse.

Automobile | The largest market for IoT

Four megatrends reshaping the automotive market

ADAS and Autonomous Driving

- Today, Advanced driver assistance systems (ADAS) are found in every mid range car
- 0-accident remains a target for most governments

CO_2 Reduction

- CO_2 reduction leads to better engine control through higher embedded intelligence
- Ultimately, it makes electrification of power train inevitable

Connectivity

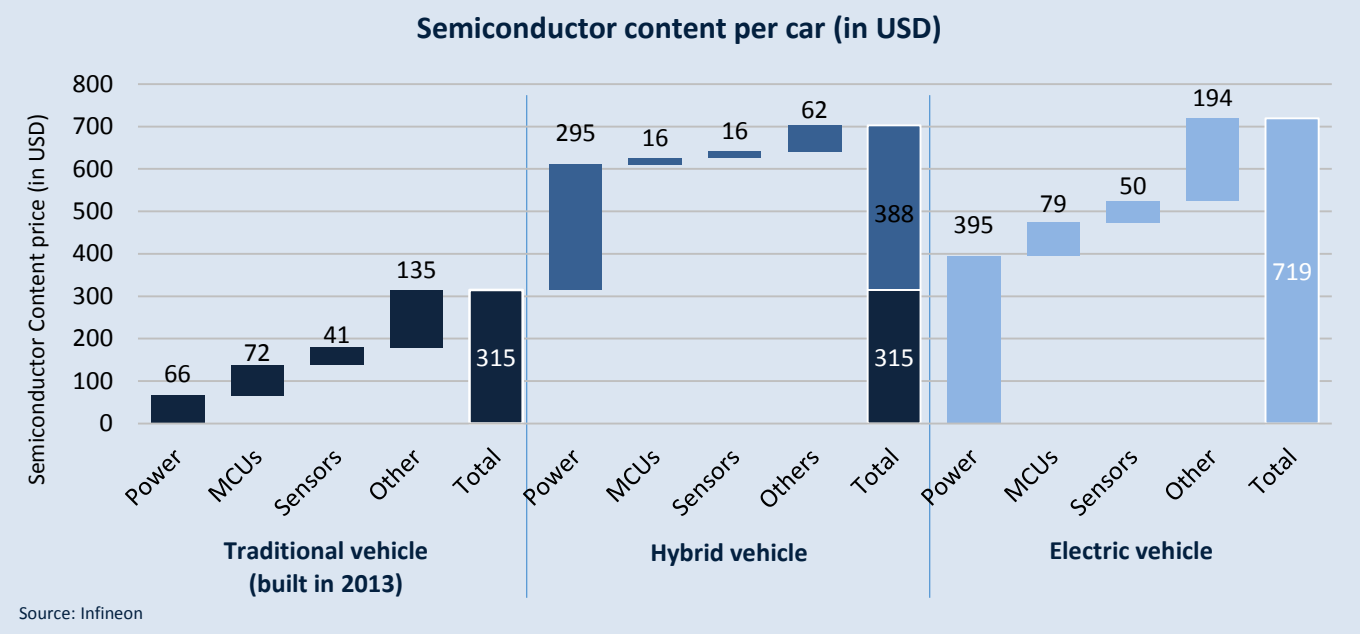
- Cars are the most advanced pieces of technology still unconnected to the internet
- Ultimately, the car will be fully connected to other vehicles, to the infrastructure and have in-vehicle connectivity

Advanced Security

- Increasing connectivity and software content increases risk exposure to hackers
- Internal / External connectivity must be secured

Automobile | EV double the value of semiconductor content per car

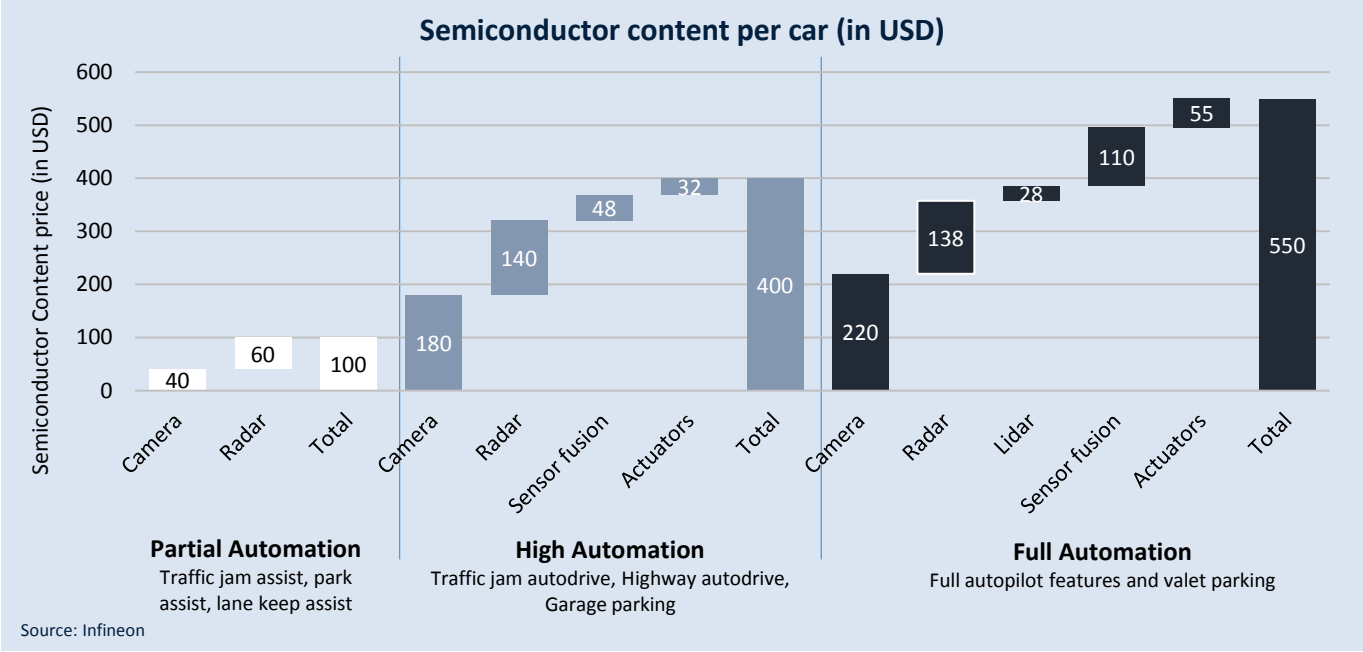
Electric and Hybrid vehicles include 2x more semiconductors than traditional vehicles



Source: Infineon

Automobile | Autonomous driving also helps significantly

Full autonomous car semiconductor value for ADAS is 5x more than today's high end vehicle



Source: Infineon

Automobile | Connected cars might come earlier than expected

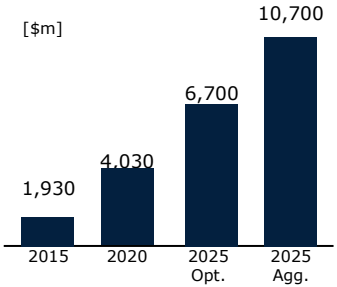
Today's leading edge	Next step
Wifi: - Internet Hotspot - Access to the cloud	**Wifi:** - Car-to-X communication - Value added: single chip w/ V2X and Hotspot feature - Remote software update
Broadcast: - Digital tuner for Audio	**Broadcast:** - Video and data streaming capabilities
Positioning: - Navigation - ADAS through precise positioning	**Positioning:** - Multi-constellation support - Sub-metre precision for ADAS - Satellite data stream
Cellular: - Emergency call - Insurance box	**Cellular:** - Infotainment and Internet access - Smartphone replication - Cloud connectivity

Connection capability increases the need for Security chips

Automobile | Strong market opportunities for Semi players

ADAS/Autonomous driving

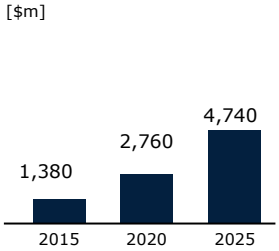
CAGR 2015/2020e: 16%



Biggest drivers on automotive

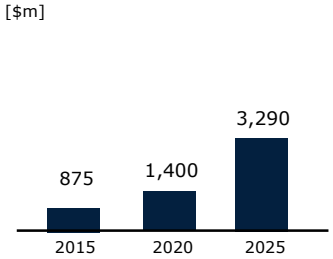
xEV/eMobility

CAGR 2015/2020e: 15%



Connectivity

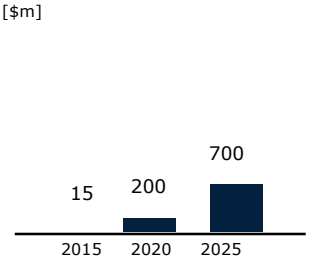
CAGR 2015/2020e: 10%



Market shaped by mobile coms players

Advanced security

CAGR 2015/2020e: ~70%



Key enabler for connectivity

Sources: IHS, Strategy Analytics, Infineon

Automobile | Who will benefit in Europe?

STMicroelectronics (Neutral, FV EUR7)

- Market leader in ADAS (claims 68% market share in 2015 w/ 270 car model equipped).
- Maintain a strong partnership w/ Mobileye (leader).
- Large portfolio and strong positions in other subsystems.
- **Automotive revenues account for 25% of total group's revenue or USD1.7bn (EUR1.6bn) in 2015.**

Infineon (Buy, FV EUR15)

- Strong positioning in Power control, Sensors and Microcontrollers.
- Gaining market shares WW: +1ppt in 2015.
- Benefiting from International Rectifier acquisition.
- **Automotive revenues account for 41% of total group's revenue or USD2.6bn (EUR2.4bn) in 2015.**

NXP (uncovered)

- Leader in Auto thanks to the acquisition of Freescale.
- Freescale is #3 in radar chips (#1 IFX, #2 STM).
- #3 in MCUs (Renesas remains uncontested leader in this field).
- **Automotive revenues account for about 35% of total group's revenue or USD3.3bn (EUR3.0bn)**

*(based on Bloomberg ests.).

ARM Holdings (Buy, FV 1,310p)

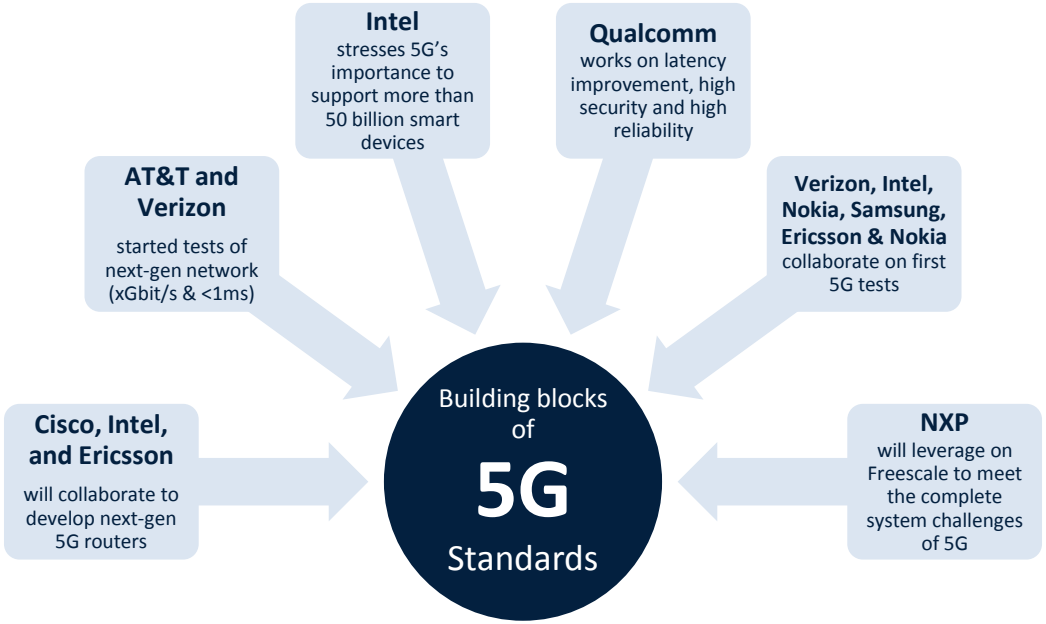
- Provider of IP blocks for MCUs used in Automotive.
- Play the increasing number of 32bits MCUs per car.
- SAM estimated at USD15bn by the group in 2020, up from USD10bn in 2015.
- **Automotive revenues est. at about 1% of total group's revenue but at high growth: CAGR15-20e of 17%**

also Melexis, u-blox, Dialog (Buy, FV EUR40) and Imagination

Topic #2 | 5G Infrastructure

5G Infrastructure

5G Infrastructure| What happened at MWC2016 about 5G



What we already know: **5G introduces a whole new network architecture**

5G Infrastructure| 5G is about unifying connectivity

Hardware challenge: unifying connectivity means implementing very flexible hardware solutions

Source: Ericsson

5G Infrastructure| 5G is about network slicing!

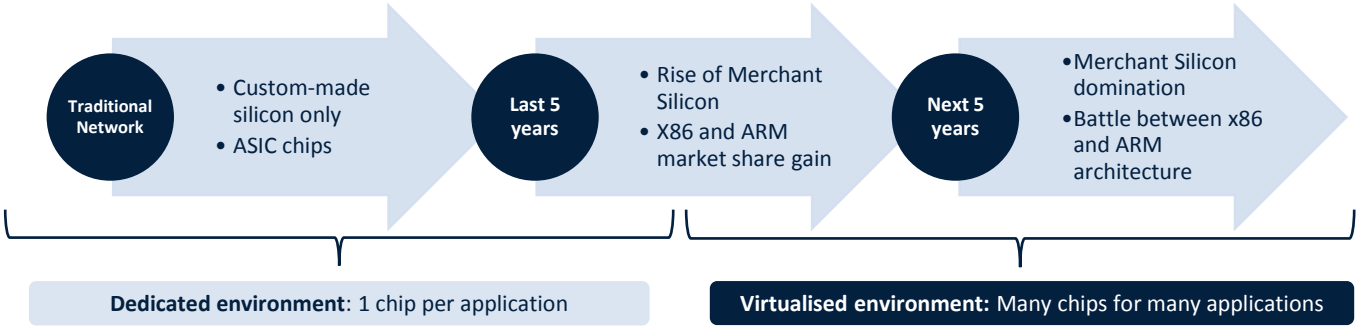
One hardware, one network – many applications, many network slices

In 5G systems, networks will be further abstracted into network slices

A slice will be a connectivity service defined by a number of customisable software-defined functions that govern geographical coverage area, duration, capacity, speed, latency, robustness, security and availability.

5G Infrastructure| benefits from NFV and SDN being deployed today

Recent trends in Infrastructure are the next 5G enablers



Usages are changing and oblige infrastructures to strengthen

- Gartner forecasts that 6.4 billion connected things will be in use worldwide in 2016, up 30% from 2015, and will reach 20.8 billion by 2020.
- Stress on networks is set to intensify due to 1/ an increasing number of connected devices and 2/ data consumption per device is increasing due to video streaming

The revolution in network infrastructure

- We note that operators and equipment makers are adopting three trends: **Network function Virtualisation**, **Software Defined Network and Cloud-RAN**
- **Networking equipment is looking more and more to a pool of standard servers**

A market worth USD18bn in 2020e (2015/20e CAGR of 3.1%)

5G Infrastructure| 5G summary

Might be the largest evolution since the creation of GSM

Allows new communication habits

With connectivity at the heart of industry transformation, 5G systems have a significant role to play – not just in the evolution of communication but in the evolution of businesses and society as a whole.

Introduces Network slices

Allows to deliver differentiated offerings, as they can provide connectivity that is adapted and optimised for each and every application and improve network resources efficiency.

Increasing HW / SW separation

Requires a new network architecture

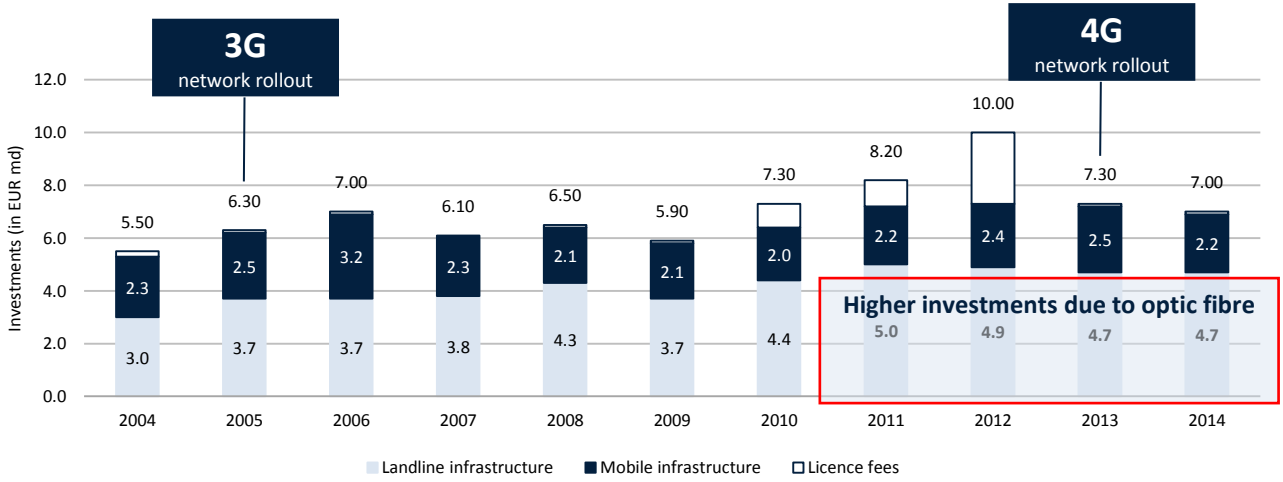
Broken down into building blocks through SDN, NFV and virtualisation technologies, 5G systems will provide a greater level of abstraction.

A more flexible hardware

Network functions can then be chained together as logical network slices supported by management and orchestration along with a flexible radio access environment.

5G Infrastructure| Might not be that impactful for the semi industry

Historic analysis shows that a new generation of equipment does not boost capex at Mobile operators
Example of infrastructure investments in France from 2004 to 2014 including two network generation rollouts :



Source: ARCEP

We do not expect 5G to be a catalyst for semiconductor companies

5G Infrastructure| Who will benefit in Europe?

In our view, the only European player to benefit from 5G transition could be ARM Holdings

ARM Holdings (Buy, FV 1,310p)

- To prepare **5G transition**, operators and equipment makers are adopting **new network architecture**: Network function Virtualisation, Software Defined Network and Cloud-RAN.
- This **gives ARM an opportunity** to enter this segment.
- **Hardware and Software ecosystem strengthen rapidly**:
  - ARM's silicon partners are AppliedMicro, Broadcom, Cavium, HiSilicon, LSI and Texas Instruments.
  - In Software, OPNFV core and virtual machines run on ARM-based systems.
- ARM's shows **strong progress in terms of market shares**:
  - In 2015, ARM boasted market share of 15% in this segment and showed a solid market share gain (up from 10% in 2014, and 5% in 2013).
- An **opportunity of about USD16bn for ARM in 2016e** or 1.4bn processors with a high ASP (~USD12 per chip). The market is expected to reach about USD18bn by 2020e, i.e. achieving a 2015/20e CARG of 3.1%.

also Soitec (Neutral, FV EUR0.50)

Topic #3: Security for IoT

Security for IoT

IoT Security | What happened at MWC 2016 about Security?

This year, at MWC 2016, all players from any position in the IoT supply chain agreed to say that security is the biggest threat to IoT growth.

GSMA's guidance
GSMA published a set of guidance documents to promote a methodology for developing secure IoT services.

Dedicated conferences
Then, players in the IoT field hosted conferences about the challenges of securing the Internet of Things.

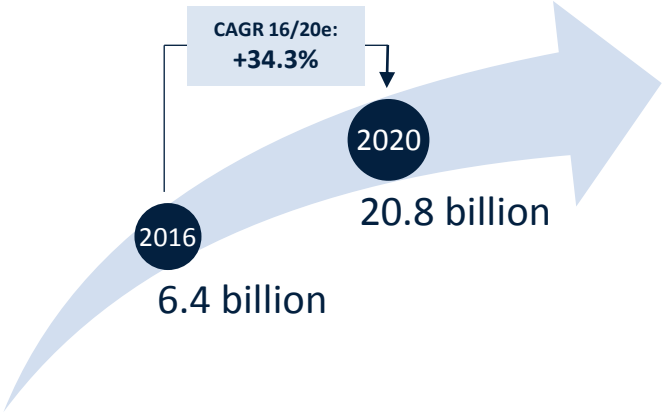
Call from leaders
We have seen a massive call for securing IoT from industry leaders such as ARM's CEO.

Multiple announcements
Announcement of new products dedicated to securing IoT

IoT Security | IoT represents a strong opportunity…

Simply put, IoT is the combination of connected things and intelligent services.

Number of connected devices



In 2016…

+5.5 million per day

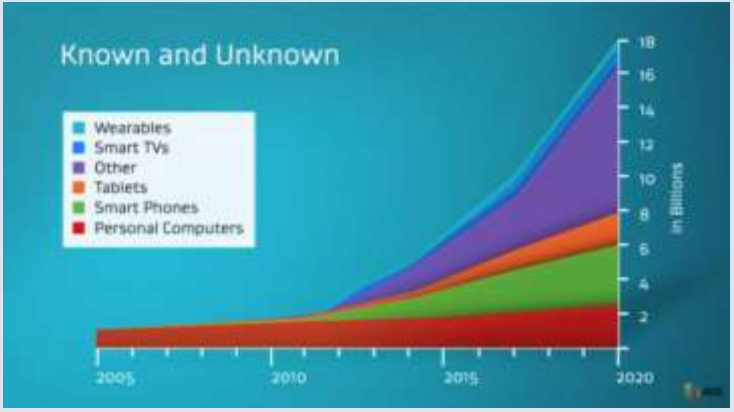
5.5 million new things will get connected every day

- Gartner forecasts that 6.4 billion connected devices will be in use worldwide in 2016, up 30% from 2015, and will reach 20.8 billion by 2020.
- These things know where you are, what app you are using, your sleep patterns, how fast you drive…

IoT Security | …but it remains hard to define so far

And while we know it's coming, we don't really know what's coming!

In 1950, the famous American scientific magazine Popular Mechanics predicted that the future computer will weigh less than one and a half ton…



- **Everything from cars to clothes to factory machines is being networked.**
- **Almost no market left untouched.**

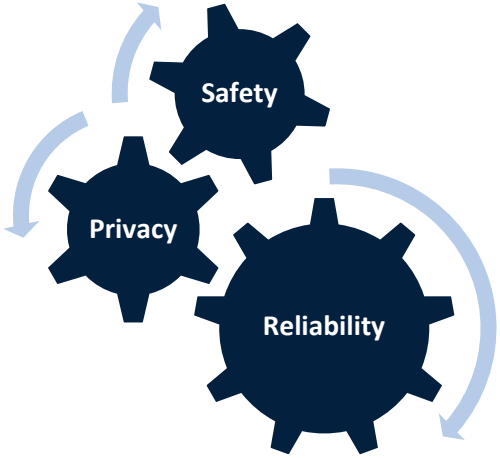
IoT Security | Motivation: IoT is also an opportunity for hackers

The emerging Internet of Things (IoT) presents tremendous opportunities…

… but also great risk.

A new attack vector for hackers

Many developers working in the IoT field are not security experts. They are experts in manufacturing, cars, home appliances, or other domains. These developers need to include security in their products but this security must also meet their domain requirements.



Security concern arises from IoT rapid expansion…

The potential of IoT opportunity depends on trust and security

IoT Security | People start to worry about security due to press articles

The Story

- Last year, Wired came out with a story of a car being hacked and controlled remotely while the driver was unable to regain control of the car (see here: Wired)
- According to the article, the hackers took control of the radio system, wipers, climate system, and horn, but more importantly the seat belt system, the brakes and the steering wheel.

Details about the exploit

- The hacked Jeep belonged to the hackers.
- Hackers had worked on this particular car for more than a year to achieve the exploit.
- The car requires a 3G connection which remains rare.
- The car ran an out-of-date software with a security breach; an update had been applied to other cars.

Back to Reality

- Connected cars remain rare : representing ~0.2% of cars shipped in 2015 (ABI Research).
- About 20% of these connected cars are actually really connected to the network (ABI Research).
- Wireless connectivity is rapidly expanding from luxury cars to high volume mid-range models.
- By 2020, there will be a quarter billion connected vehicles on the road according to Gartner.

IoT Security | The internet of things must be secure in order to succeed

Garmin, Jawbone, Withings and Xiaomi Fitbands

- Expose personal data
- These data are used in real life: there are examples of lawsuits where these data could be crucial evidence

Smart-TV camera

- Expose personal life
- Video can be streamed live over the web without the user's knowledge

Baby phones

- Expose personal life
- Hacker could talk to babies and stream video over the web

Other examples exist in other applications:

- Industrial (Home Appliance)
- Health
- Traffic lights
- …

In 2014, a white hat team of **students** at the University of Michigan **took control of real, networked traffic signals** and found that they could change the status of the lights (red, green, yellow) remotely. **It was found that factory default settings were left unchanged and network commands were unencrypted.**

Since IoT is moving to more and more applications, from Healthcare to Industrial including autonomous driving, the success of these connected things depends on security.

IoT Security | Best practice: Security by Design

Hardware will play a key role in the security implementation

- Most companies do not have the expertise to protect the data created
- Hardware-based security is stronger than software-based.
- Hardware security stands the test of time.
- According to ARM, a software update development is often more expensive than the costs of a new device (as a result, known-broken systems are kept in use).
- Hardware security is based on industry standards, not on proprietary standards.

IoT Security | Role for chip-based, hardware security

- Audit
- Crypto key establishment and management
- Crypto offloads
- Lifecycle management
- Platform integrity verification
- Authentication
- Stored data protection
- Secure communications
- Boot process protection
- Secure software and firmware update

IoT Security | Who will benefit in Europe?

NXP (uncovered)

- **#1 Secure Microcontroller market with 31% market share.**
- Security controllers SmartMX2 family.
- Strong position in NFC and Secure Element chips.
- **Security revenues estimated at about 13% of total group's revenue or USD800m (EUR720m) in 2015.**

Infineon (Buy, FV EUR15)

- **#2 Secure Microcontroller market with 24% market share.**
- Security controllers (SLM 76, SLM 97 for industrial and SLI 76, SLI 97 for automotive).
- Secure Elements and µcontrollers (OPTIGA Trust).
- **Security revenues account for more than 13% of total group's revenue or USD734m (EUR667m) in 2015.**

STMicroelectronics (Neutral, FV EUR7)

- **#4 Secure Microcontroller market with 15% market share (#3 is Samsung w/ 16%).**
- Security Platform: controllers and secure elements ST33.
- Might be linked with connectivity module to create ST54 Platform.
- **Security revenues estimated at about 6% of total group's revenue or USD400m (EUR360m) in 2015.**

ARM Holdings (Buy, FV 1,310p)

- Provider of IP blocks for secure MCUs.
- High implication in IoT development: ARM technology was in around 32% of the chips used in all the smart electronic devices sold in 2015.
- Develop a secure OS and a secure connectivity solution to be embedded in secure MCUs.
- From early 2016, ARM is introducing new processors designed for microcontrollers and smart sensors that will help secure data inside low-cost chips.

MWC 2016 | To conclude

Given our observations at MWC, we are convinced that opportunities remain for :

1. **Infineon (Buy, FV EUR15):**
   - Boasts strong position in buoyant markets,
   - Continues to leverage on International Rectifiers to gain market shares,
   - Benefits from an improving NT momentum in the Automotive segment with the end of inventory adjustments,
   - Shows potential of EPS growth (BG ests. 2015/18e CAGR of 17%),
   - **Our FV points to a >20% upside**.

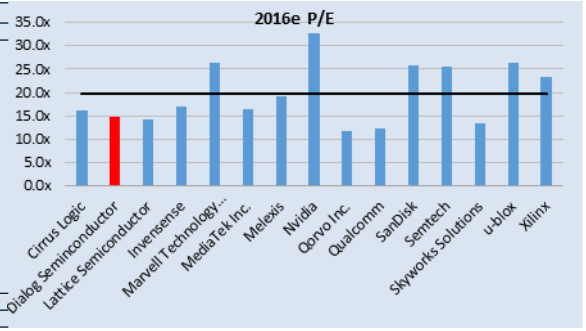
2. **ARM (Buy, FV 1,310p):**
   - Benefits from a unique technology portfolio to gain market shares,
   - Proved to be resilient to smartphone market softness,
   - Heading to market share gain in Server and Networking infrastructure,
   - Shows potential of EPS growth (BG ests. 2015/18e CAGR of 13%),
   - **Our FV points to a >30% upside**.

Q&A

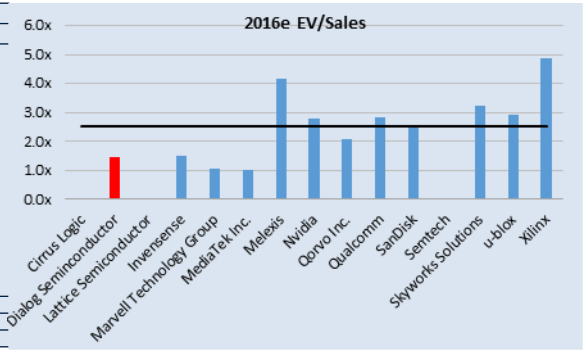
Q&A

Appendix | Valuation table - Semiconductor Fabless

Fabless (15)	P/E		EV/EBIT		EV/Sales	
	CY16	CY17	CY16	CY17	CY15	CY16
Cirrus Logic	16.1x	12.5x	-	-	-	-
Dialog Semiconductor	**14.8x**	**12.2x**	**7.5x**	**5.9x**	**1.5x**	**1.2x**
Lattice Semiconductor	14.1x	9.6x	-	-	-	-
Invensense	16.9x	17.6x	11.6x	13.1x	1.5x	1.5x
Marvell Technology Group	26.2x	21.8x	15.9x	11.1x	1.1x	1.1x
MediaTek Inc.	16.5x	15.0x	10.2x	9.3x	1.0x	1.0x
Melexis	19.2x	17.9x	15.9x	14.4x	4.2x	3.8x
Nvidia	32.8x	24.4x	18.8x	12.8x	2.8x	2.5x
Qorvo Inc.	11.9x	10.8x	8.0x	7.0x	2.1x	2.0x
Qualcomm	12.4x	10.7x	9.1x	7.8x	2.8x	2.7x
SanDisk	25.9x	23.0x	16.2x	15.1x	2.6x	2.4x
Semtech	25.6x	17.0x	-	-	-	-
Skyworks Solutions	13.4x	11.5x	8.3x	7.2x	3.2x	2.9x
u-blox	26.4x	22.0x	19.7x	16.2x	2.9x	2.4x
Xilinx	23.3x	21.2x	16.3x	14.9x	4.9x	4.6x
Fabless (15) average	**19.7x**	**16.5x**	**13.1x**	**11.2x**	**2.5x**	**2.3x**
Fabless (15) median	**16.9x**	**17.0x**	**13.8x**	**11.9x**	**2.7x**	**2.4x**



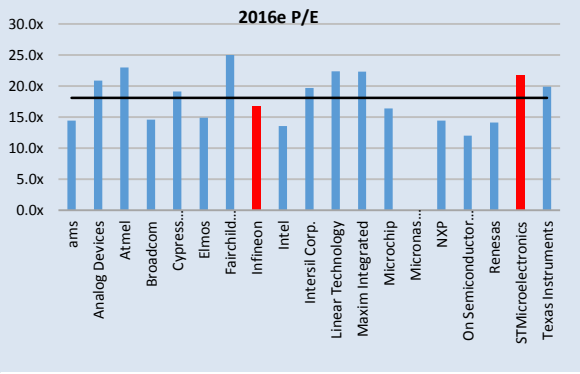
Fabless (15)	Mkt Cap (EURbn)	Perf YTD	Sales		Sales growth		EBIT Margin	
			CY16	CY17	CY16	CY17	CY16	CY17
Cirrus Logic	2,014	17.1%	1,164	1,343	27.0%	15.4%	18.9%	20.1%
Dialog Semiconductor	**2,549**	**4.4%**	**1,388**	**1,572**	**2.4%**	**13.3%**	**19.5%**	**20.7%**
Lattice Semiconductor	632	-9.7%	465	503	13.1%	8.3%	17.6%	NM
Invensense	677	-23.0%	421	406	13.2%	-3.5%	12.9%	11.2%
Marvell Technology Group	4,771	15.5%	2,767	2,543	-25.3%	-8.1%	6.6%	9.9%
MediaTek Inc.	10,513	-4.0%	241,173	249,818	13.1%	3.6%	9.7%	10.3%
Melexis	1,915	-5.1%	436	473	9.1%	8.3%	26.2%	26.4%
Nvidia	17,149	5.7%	5,010	5,325	7.0%	6.3%	14.9%	19.7%
Qorvo Inc.	6,200	-3.5%	2,602	2,775	52.1%	6.7%	26.0%	28.0%
Qualcomm	67,747	0.4%	22,459	23,719	-11.1%	5.6%	31.3%	33.9%
SanDisk	13,662	-0.4%	5,442	5,800	-2.2%	6.6%	15.8%	15.9%
Semtech	1,276	15.5%	490	529	-12.1%	8.0%	16.4%	21.6%
Skyworks Solutions	13,104	0.1%	3,408	3,817	4.6%	12.0%	38.5%	40.0%
u-blox	1,122	-15.2%	407	482	20.4%	18.4%	14.8%	15.0%
Xilinx	10,795	0.1%	2,209	2,347	-7.1%	6.3%	29.9%	30.5%
Fabless (15) average	**10,275**	**0%**	**19,323**	**20,097**	**6.9%**	**7.1%**	**19.9%**	**21.7%**
Fabless (15) median	**4,771**	**0%**	**2,209**	**2,347**	**7.0%**	**6.7%**	**17.6%**	**20.4%**
Fabless (15) aggregate	**154,125**				**9.7%**	**4.0%**	**12.4%**	**13.3%**



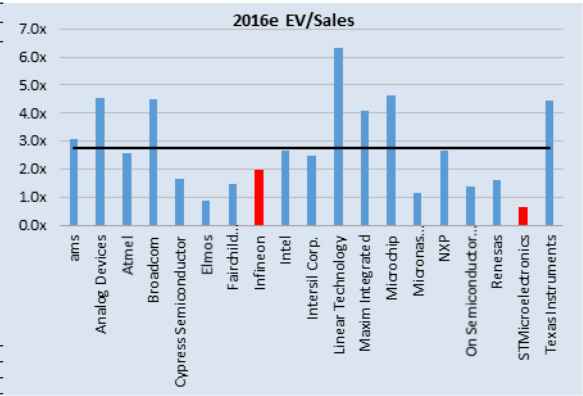
BG coverage in red ; Source: Thomson Reuters I.B.E.S. updated on 31/03/2016

Appendix | Valuation table - Semiconductor IDM

Logic & Analog IDM (19)	P/E		EV/EBIT		EV/Sales	
	CY15	CY16	CY15	CY16	CY15	CY16
ams	**14.4x**	**11.4x**	**13.8x**	**9.7x**	**3.1x**	**2.4x**
Analog Devices	20.9x	18.3x	14.0x	12.4x	4.5x	4.2x
Atmel	23.0x	20.7x	18.8x	15.9x	2.6x	2.5x
Broadcom	14.6x	12.2x	12.1x	8.9x	4.5x	3.5x
Cypress Semiconductor	19.1x	10.5x	15.9x	9.9x	1.6x	1.5x
Elmos	14.9x	12.7x	8.9x	7.2x	0.9x	0.8x
Fairchild Semiconductor	25.0x	18.7x	18.5x	14.5x	1.5x	1.4x
Infineon	**16.9x**	**14.4x**	**13.6x**	**11.5x**	**2.0x**	**1.8x**
Intel	13.5x	12.3x	10.2x	9.1x	2.7x	2.5x
Intersil Corp.	19.7x	17.4x	11.7x	11.2x	2.5x	2.3x
Linear Technology	22.4x	20.6x	14.1x	12.8x	6.3x	5.9x
Maxim Integrated	22.3x	18.6x	15.0x	12.3x	4.1x	3.8x
Microchip	16.4x	15.1x	14.7x	14.8x	4.7x	4.7x
Micronas Semiconductor	NM	28.3x	26.6x	13.0x	1.1x	1.0x
NXP	14.4x	11.1x	10.3x	7.8x	2.7x	2.3x
On Semiconductor Corp.	12.0x	9.7x	11.2x	8.8x	1.4x	1.2x
Renesas	14.1x	13.7x	10.2x	9.4x	1.6x	1.5x
STMicroelectronics	**21.7x**	**12.3x**	**16.5x**	**9.6x**	**0.7x**	**0.6x**
Texas Instruments	19.9x	18.0x	13.2x	12.0x	4.4x	4.2x
Logic & Analog IDM (19) average	**18.1x**	**15.6x**	**14.2x**	**11.1x**	**2.8x**	**2.5x**
Logic & Analog IDM (19) median	**18.0x**	**14.4x**	**13.8x**	**11.2x**	**2.6x**	**2.3x**



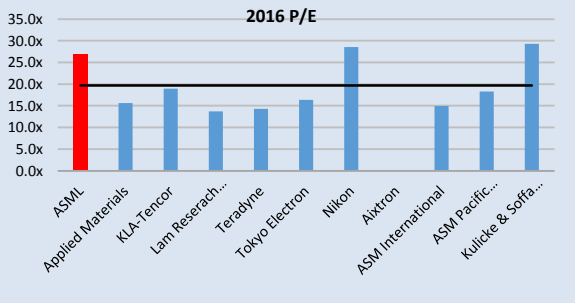
Logic & Analog IDM (19)	Mkt Cap (EURbn)	Perf YTD	Sales		Sales growth		EBIT Margin	
			CY15	CY16	CY15	CY16	CY15	CY16
Analog Devices	14,568	-8.6%	3,376	3,662	-1.7%	8.5%	32.1%	34.7%
Atmel	3,081	-7.4%	1,173	1,189	-0.7%	1.4%	13.7%	14.2%
ams	1,840	-19.5%	673	772	9.1%	14.7%	23.4%	25.6%
Cypress Semiconductor	2,535	-22.1%	1,802	1,888	11.7%	4.8%	14.2%	19.1%
Fairchild Semiconductor	2,125	-2.4%	1,374	1,460	-0.4%	6.3%	8.7%	11.7%
Infineon	**13,444**	**-13.1%**	**6,554**	**7,024**	**13.1%**	**7.2%**	**15.5%**	**16.0%**
Intel	129,311	-14.1%	59,095	61,599	6.8%	4.2%	26.7%	27.7%
Intersil Corp.	1,417	-9.1%	538	562	3.0%	4.4%	21.1%	18.7%
Linear Technology	9,282	-3.2%	1,422	1,519	-3.6%	6.8%	44.6%	46.0%
Microchip	8,184	-7.9%	2,399	2,557	8.5%	6.6%	31.4%	32.2%
STMicroelectronics	**5,131**	**-11.1%**	**6,998**	**7,408**	**1.5%**	**5.9%**	**4.8%**	**7.0%**
Maxim Integrated	46,700	-10.6%	13,296	13,854	2.1%	4.2%	33.1%	33.7%
On Semiconductor Corp.	8,157	-18.0%	2,216	2,342	-3.9%	5.7%	27.9%	31.7%
NXP	3,200	-15.6%	3,542	3,725	1.0%	5.2%	11.9%	13.2%
Micronas Semiconductor	16,760	-16.0%	9,799	10,561	69.4%	7.8%	25.2%	28.5%
Melexis	200	-0.5%	141	152	6.5%	7.4%	4.4%	8.0%
Logic & Analog IDM (19) average	**16,621**	**-11%**	**7,150**	**7,517**	**8%**	**6%**	**21%**	**23%**
Logic & Analog IDM (19) median	**6,644**	**-11%**	**2,308**	**2,450**	**3%**	**6%**	**22%**	**22%**
Logic & Analog IDM (19) aggregate	**265,935**				**8.7%**	**5.1%**	**24.8%**	**26.1%**



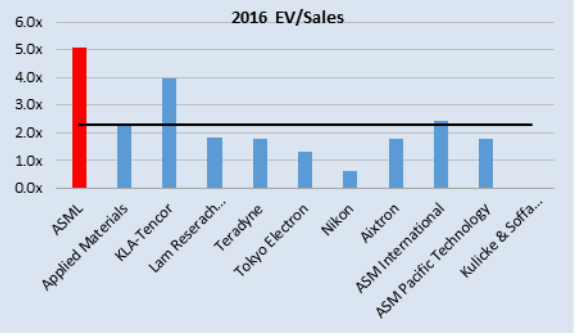
BG coverage in red ; Source: Thomson Reuters I.B.E.S. updated on 31/03/2016

Appendix | Valuation table - Semiconductor Capital Equipment

Semiconductor Equipment & Materials (11)	P/E		EV/EBIT		EV/Sales	
	CY16	CY17	CY16	CY17	CY15	CY16
ASML	26.8x	20.9x	20.9x	16.2x	5.1x	4.4x
Applied Materials	15.6x	12.7x	11.1x	9.0x	2.2x	2.0x
KLA-Tencor	18.9x	16.6x	13.2x	11.1x	4.0x	3.4x
Lam Reserach Corporation	13.7x	11.7x	8.7x	7.1x	1.8x	1.6x
Teradyne	14.3x	12.9x	8.8x	8.7x	1.8x	1.8x
Tokyo Electron	16.3x	15.2x	6.6x	6.3x	1.3x	1.2x
Nikon	28.5x	18.7x	8.5x	8.4x	0.6x	0.6x
Aixtron	NM	NM	NM	NM	1.8x	1.4x
ASM International	15.0x	12.8x	14.5x	9.6x	2.4x	1.7x
ASM Pacific Technology	18.3x	15.2x	13.2x	10.8x	1.8x	1.6x
Kulicke & Soffa Industries	29.3x	15.7x	-	-	-	-
Semiconductor Equipment & Materials (11) average	**19.7x**	**15.2x**	**11.7x**	**9.7x**	**2.3x**	**2.0x**
Semiconductor Equipment & Materials (11) median	**17.3x**	**15.2x**	**11.1x**	**9.0x**	**1.8x**	**1.7x**



Semiconductor Equipment & Materials (11)	Mkt Cap (EURbn)	Perf YTD	Sales		Sales growth		EBIT Margin	
			CY16	CY17	CY16	CY17	CY16	CY17
ASML	38,203	4.8%	6,584	7,449	4.7%	13.1%	24.4%	27.2%
Applied Materials	20,815	8.2%	9,698	10,427	0.4%	7.5%	20.0%	22.1%
KLA-Tencor	10,070	2.2%	2,847	3,090	1.2%	8.6%	30.1%	31.1%
Lam Reserach Corporation	11,640	-0.4%	5,821	6,280	10.7%	7.9%	20.9%	22.7%
Teradyne	3,920	1.8%	1,831	1,862	11.7%	1.7%	20.5%	21.0%
Tokyo Electron	9,413	-0.2%	661	664	7.8%	0.6%	20.0%	19.6%
Nikon	5,629	10.3%	838	871	-2.3%	3.9%	7.5%	7.3%
Aixtron	428	-7.7%	187	232	-5.3%	23.9%	-11.9%	-0.9%
ASM International	2,409	5.3%	682	759	1.8%	11.4%	16.6%	18.0%
ASM Pacific Technology	2,867	3.5%	13,513	14,504	4.1%	7.3%	13.6%	15.0%
Kulicke & Soffa Industries	690	-8.0%	556	605	3.6%	8.9%	6.2%	10.5%
Semiconductor Equipment & Materials (11) average	**9,644**	**2%**	**3,929**	**4,249**	**3.5%**	**8.6%**	**15.3%**	**17.6%**
Semiconductor Equipment & Materials (11) median	**5,629**	**2%**	**1,831**	**1,862**	**3.6%**	**7.9%**	**20.0%**	**19.6%**
Semiconductor Equipment & Materials (11) aggr.	**106,085**				**4.1%**	**8.2%**	**18.8%**	**20.7%**



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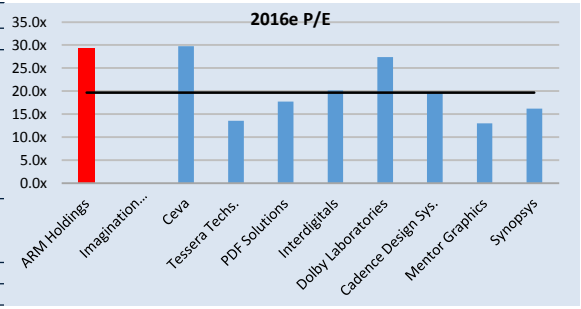
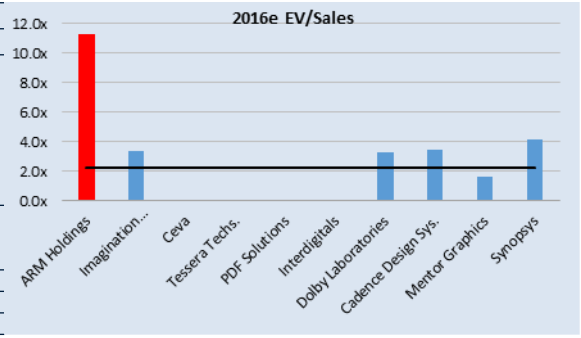
Appendix | Valuation table - IP & EDA vendors

Intellectual Property & EDA (10)	P/E		EV/EBIT		EV/Sales	
	CY16	CY17	CY16	CY17	CY15	CY16
ARM Holdings	**29.4x**	**25.1x**	**23.4x**	**19.9x**	**11.3x**	**10.0x**
Imagination Technologies	NM	31.3x	-107.6x	28.5x	3.4x	3.2x
Ceva	29.8x	22.2x	-	-	-	-
Tessera Techs.	13.5x	12.6x	-	-	-	-
PDF Solutions	17.7x	14.7x	-	-	-	-
Interdigitals	20.2x	16.4x	-	-	-	-
Dolby Laboratories	27.4x	23.2x	15.8x	12.6x	3.3x	2.9x
Cadence Design Sys.	19.5x	17.6x	13.4x	12.0x	3.5x	3.1x
Mentor Graphics	13.0x	12.0x	8.1x	8.7x	1.6x	1.8x
Synopsys	16.2x	15.0x	17.3x	16.5x	4.1x	4.0x
Intellectual Property & EDA (10) average	**20.7x**	**19.0x**	**-4.9x**	**16.4x**	**4.5x**	**4.2x**
Intellectual Property & EDA (10) median	**19.5x**	**17.0x**	**14.6x**	**14.6x**	**3.4x**	**3.1x**



Intellectual Property & EDA (10)	Mkt Cap (EURbn)	Perf YTD	Sales		Sales growth		EBIT Margin	
			CY16	CY17	CY16	CY17	CY16	CY17
ARM Holdings	**18,124**	**-3.6%**	**1,131**	**1,261**	**16.8%**	**11.5%**	**48.4%**	**50.5%**
Imagination Technologies	652	39.9%	148	155	-16.5%	5.0%	-3.1%	11.1%
Ceva	403	-11.6%	67	76	13.0%	12.5%	24.9%	28.8%
Tessera Techs.	1,386	0.8%	260	280	-4.8%	7.5%	57.1%	62.9%
PDF Solutions	383	23.1%	109	124	11.4%	13.7%	16.4%	NM
Interdigitals	1,706	8.3%	379	419	-14.0%	10.3%	37.6%	42.5%
Dolby Laboratories	2,008	23.8%	1,017	1,073	5.1%	5.5%	20.8%	23.1%
Cadence Design Sys.	6,400	10.4%	1,818	1,927	6.8%	6.0%	26.0%	25.4%
Mentor Graphics	1,925	6.2%	1,181	1,215	-5.1%	2.9%	20.2%	20.3%
Synopsys	6,539	4.5%	2,376	2,519	6.0%	6.0%	24.0%	24.3%
Intellectual Property & EDA (10) average	**3,953**	**10%**	**849**	**905**	**1.9%**	**8.1%**	**27.2%**	**32.1%**
Intellectual Property & EDA (10) median	**1,816**	**7%**	**698**	**746**	**5.5%**	**6.8%**	**24.4%**	**25.4%**
Intellectual Property & EDA (10) aggregate	**39,528**				**3.8%**	**6.6%**	**27.8%**	**29.3%**



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Appendix | Snapshot of the size and structure of the industry