Mi-Tech Vol. 50: A Look at the LiDAR Market Through 2024E

Summary

In Vol. 50 of the Mi-Global Tech series, we take a look at the emerging LiDAR market. The 2018 Audi A8 is on track to become the first commercially available car with LiDAR; going forward, we believe advancements in solid state LiDAR (SSL) technology, the reduction in cost, and the demand for a full sensor fusion will could significant demand acceleration in the market between 2017 and 2021. Some key takeaways: **1)** a look at history with airbags, LDW and seat belt adoption; **2)** history shows automotive adoption gets to ~50% in 5-7 years; and **3)** LiDAR adoption could get to 20% in 5 years to 2021E and grow to an $8B automotive LiDAR market (<$500M today) and a ~$30B fusion LiDAR ADAS market (vs <$1B today), not to mention the adjacent data, AI, and services markets it could spawn.

Company	Symbol	Price (4/03)	Rating Prior	Rating Curr	PT
Autoliv, Inc.	ALV	$100.69	–	Neutral	$115.00
Cypress Semiconductor Corporation	CY	$13.51	–	Buy	$16.00
Mobileye N.V.	MBLY	$61.25	–	Neutral	$63.54
NVIDIA Corporation	NVDA	$108.38	–	Buy	$130.00
NXP Semiconductors NV	NXPI	$104.27	–	Neutral	$110.00
ON Semiconductor Corporation	ON	$15.07	–	Buy	$18.00

Source: Bloomberg and Mizuho Securities USA

Key Points

In the first decade of the 20th century, there were no stop signs, traffic lights, or speed limits. Cars and automobiles for the first 10 years were driving without any stop signs or traffic lights. According to the Detroit News, the first U.S. stop sign was introduced in Detroit in 1915. So, in the first 10 years of the automobile, there were no stop signs or traffic lights and in 1917 Detroit there were 65,000 automobiles accounting for 7,171 accidents and 168 fatalities (Link - Detroit News). Today, it would be unimaginable to think of driving through intersections without stop lights or traffic lights, but still, 2015 marked one of the highest years of automotive fatalities with 4.4M accidents and 39,052 fatalities in the U.S. (Link- L.A Times) out of 263M vehicles registered, according to Statista, highlighting the fact that we are far from done in delivering safety or the objective of Vision Zero. But, that is history and 110 years later, we are now talking autonomous driving and its perils along with the disruption it creates, much like the advent of the original automobile.

Automotive fusion ADAS and LiDAR ramps-LiDAR a $8B and Fusion ADAS $30B market by 2021E. We believe 2017E could see multiple LiDAR ramps in Europe and the US, with adoption growing to 20-30%+ by 2020-25E as AEB, ACC, and LDW features continue to ramp. While radar and cameras dominate the market today, we believe dropping SSL costs (<$200/unit) could drive adoption and accelerate ADAS and autonomous driving. **We would note the 2016 California disengagement report, where Google (with LiDAR) was far and away the best performing car at 0.2 disengagements per 1,000 miles.** We believe camera/radar only Tesla was closer to the bottom at ~330. More details and YTD global auto sales in subsequent pages.

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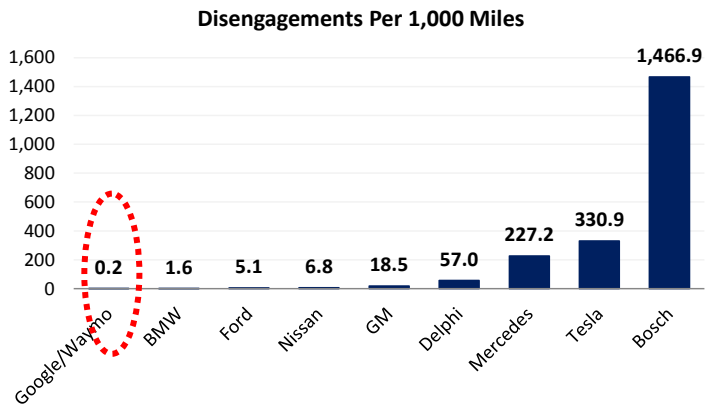
We look at some of the recent autonomous driving test results from the California DMV which shows some significant performance differences between, we believe, cars that use LiDAR and those that use only camera and radar**.**

2016 California Disengagement Report – a green light for LiDAR? In late December/early January, nine auto companies submitted results to California DMV for their autonomous driving tests (Link). The reports state the number of autonomous miles driven as well as the number of times the vehicle disengaged the autonomous features and turned control back over to the driver.

Google, by far, was the best performer in the report, with over 600k miles driven and only 124 total disengagements, or ~0.2 disengagements per 1,000 miles driven. Others who we believe fared well with their testing were BMW at 1.6 disengagements per 1,000 miles, Ford at 5.1, and Nissan at 6.8. At the bottom are Mercedes at ~277 disengagements per 1,000 miles (we would note that Mercedes had additional times in which the driver regained control of the car when they felt "uncomfortable," but was not turned back over by the car itself), Tesla with ~331, and Bosch at over ~1,400. **While the reports do not go into detail about the types of technologies being used, we believe that Google and Ford have been using LiDAR in its tests while we believe Tesla is using a camera radar/combination (no LiDAR as of yet).** We are unsure of Bosch's results, as our checks shown Bosch is one of the few Tier 1 OEMs with a full suite of ADAS sensors (mono camera/stereo camera/Radar/Lidar).

Exhibit 1: California Disengagement Report; Google Autonomous Driving Strong with the Most Miles

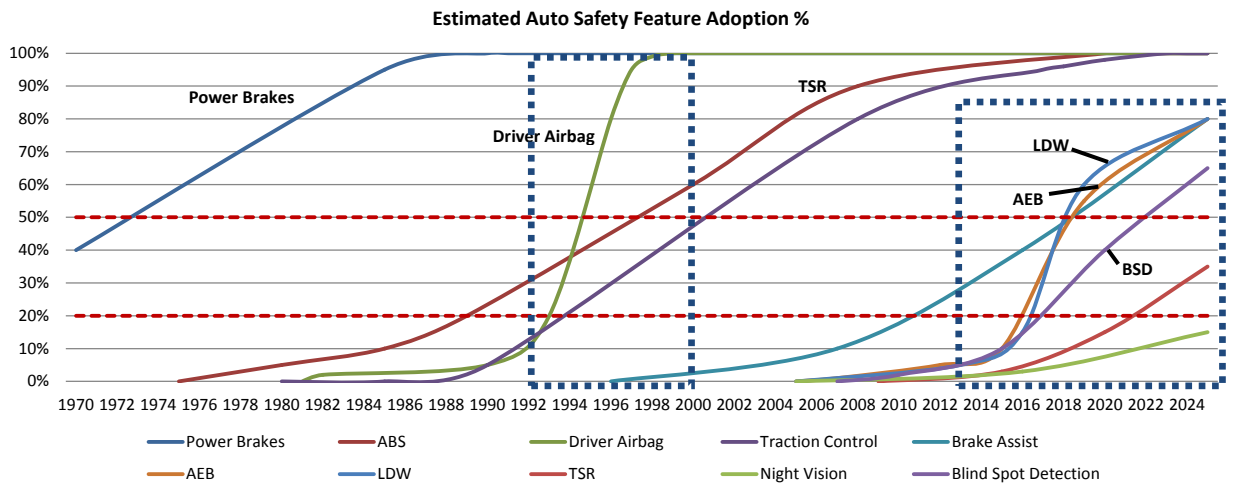


Source: California DMV, Mizuho Securities research

Ford and Uber driving the roadmap to LiDAR adoption. We believe Ford is testing 5,000-8,000 cars in the U.S. with 4-6 LiDARs as it moves towards its future vision of car sharing and autonomous driving. We believe Uber is testing cars with LiDAR in multiple states and test sites in Arizona and California; however there will be hurdles not only from a testing standpoint, but from an "acceptance" standpoint as well. Last week, it was reported that one of Uber's autonomous test vehicles in Arizona was involved in an accident which resulted in Uber shutting down its test fleet across the country. With the initial preliminary reports suggesting the accident fault was not due to the Uber autonomous vehicle, Uber is restarting (Link-Uber Arizona restart) its autonomous driving program.

A look at historical automotive safety adoption trends 1970-2020E points to a ~5-10 year ramp in autos to reach 30-40% penetration. As we show below, penetration trends from Wards, IHS, and Arthur Little consulting showing typical adoption timelines for safety features such as power brakes to airbags. As can be seen, after initial slower adoption (which we are seeing now in LiDAR), adoption or penetration ramps to 30-40% in the subsequent 5-10 years. We believe features such as AEB and LDW could see ramps similar to that of the modern airbag, which took off ~10-12 years after being first implemented on the Mercedes S-Class. Mercedes introduced its "Pre-Safe" (Daimler's AEB) system with braking capabilities on its S-Class in 2006, which we believe should put us at the beginning of a mass AEB adoption ramp, no coincidence, ~10-12 years after initial iterations. **We believe adoption of radar/camera/LiDAR-based features is a significant positive for auto suppliers ALV, MBLY, CY, NVDA, NXPI, and ON**.

Exhibit 2: Active Safety Ramps to Move Quickly - Some Historical Penetration Rates



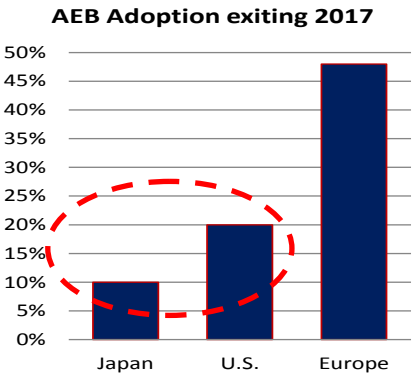
Source: MIT, NHTSA, WARDs, I.H.S., Arthur Little Analysis, Mizuho Securities estimates, *TSR=traffic sign recognition, LDW=lane departure warning, BSD=blind spot detection, AEB=autonomous emergency braking

ADAS using radar/camera today, LiDAR tomorrow. As we show in Exhibit-3, LiDAR is a better sensor in multiple weather conditions and provides more 3D-point cloud information with depth and field of view for the majority of situations required by autonomous driving versus the camera or radar. We believe that with advancements in LiDAR technology with solid-state LiDAR (SSL) and the cost reductions to go along with the improvements (~$5,000-8,000 for high sensitivity multiple laser mechanical versus <$200 for solid state), LiDAR should become a driving force behind improving and enabling Level-4/5 ADAS and autonomous driving. Key applications for LiDAR also include AEB and LDW with its ability to see lane markings, road texture and 3D-sensing.

With AEB adoption currently relatively low in the U.S. and Japan (both ~10-20% penetration still), we see significant opportunities for market growth compared to Europe where AEB adoption is in the ~45% range.

Exhibit 3: LiDAR vs. Radar vs. Camera and AEB Adoption …. The Near term Driver….

	LiDAR	Radar	Camera
Range	◆	◆	◆
Field of View	◆	◆	◆
Width and Height	◆	◆	◆
3D Shape	◆	◆	◆
Object Rec. at Long Range	◆	◆	◆
Rain, Snow, Dust	◆	◆	◆
Night	◆	◆	◆
Signs and Color	◆	◆	◆
◆-Best	◆-Better	◆-Worse	◆-Worst

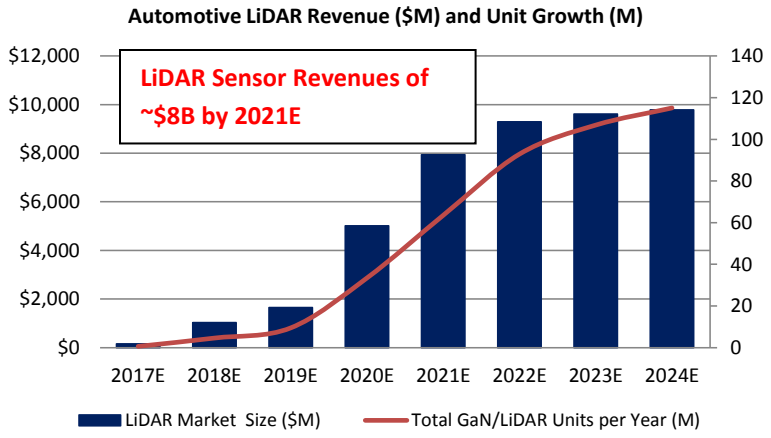


Source: Mizuho Securities estimates, company reports

Below, we take a look at what we believe the LiDAR roadmap will look like through 2024E. As ADAS is further adopted at OEMs and we move closer to autonomous driving and Level 4/5, as we have noted before, we believe sensor fusion will be key to the success of this process. A major component, we believe, is the addition and ramp of LiDAR into these fusion systems.

With Audi launching the first Level 3 production vehicle this year (2018 model year), we believe 2017E will see LiDAR enter commercial automotive production. As solid state LiDAR technology improves and costs are coming down, we believe LiDAR will begin to make an impact within the automotive industry in the next 5 years, with significant ramps from 2019-2021 and beyond. **We estimate the automotive LiDAR market could be ~$8B by 2021E, up from ~$150M in 2017E, with the potential to grow to ~$10B by 2024E.**

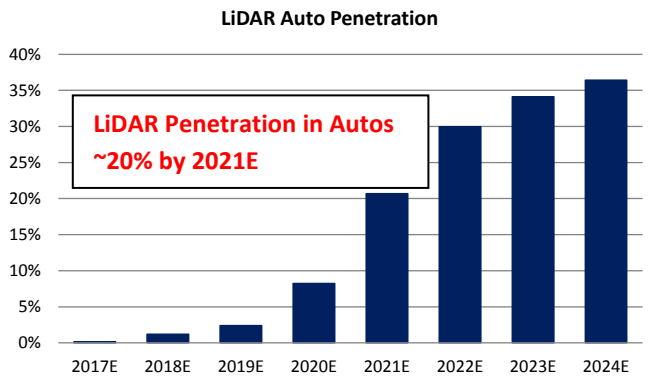
Exhibit 4: Auto LiDAR Growth Accelerating Driven AEB, ACC…. ~$8B by 2021E



Source: EPC company reports, Mizuho Securities estimates

Over time, we believe technology should improve further, allowing for fewer LiDAR units to perform the same tasks, we believe bringing LiDAR units required from ~4 to ~3, but also increasing penetration in automotive as we move towards Level-4/5 autonomous driving. **Net, we see the total automotive LiDAR market growing to ~$8B in 2021E, with total LiDAR shipments of ~64M units, implying automotive penetration of ~20%.** Much of this penetration, we believe, will be in the Europe/Japan/NA regions, with Europe the early adopters, likely at the top 3 German OEMs, similar to AEB adoption today combined with some of the thought leaders in the U.S. potentially including Ford, Tesla and Uber.

Exhibit 5: LiDAR Penetration/Adoption in Automotive out to 2024E; 20% penetration by 2021E



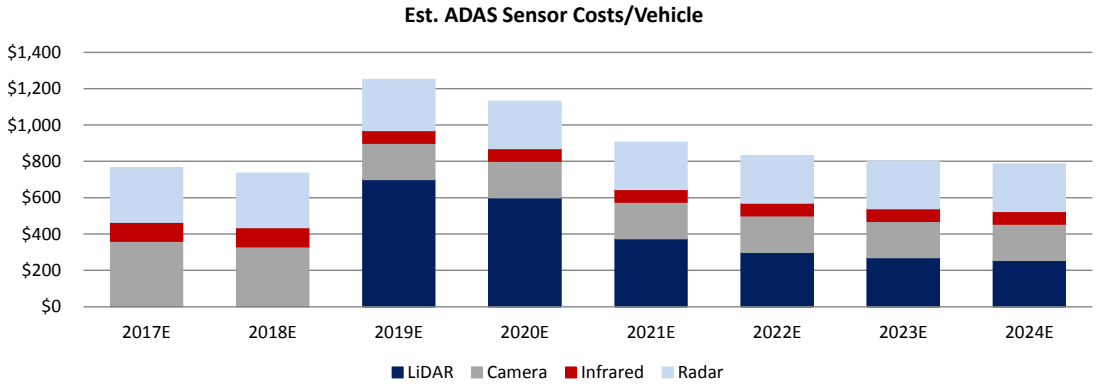
Source: EPC company reports, Mizuho Securities estimates

Despite our belief that LiDAR will become the key sensor for ADAS and autonomous driving, we believe there will be a need for all sensors in order to achieve fail-safe redundancy, at least initially. We believe over time, it will move from a buffet of safety options to a much more optimized ADAS fusion system with optimized LiDAR, radar, camera and sensing.

We believe a typical ADAS system with LiDAR will initially have ~4 units to begin with; one on each corner of the car with initial costs of ~$250 per unit (at current test stages) coming down to the 2-3 per car range. Moving into 2018 and 2019, we believe the number of LiDAR units per car will remain the same but costs will come down significantly into the ~$200/unit range as LiDAR moves to mass adoption and takes its place in a typical ADAS system. We also believe the car will have ~2-3 cameras at ~$100-120 per unit as well as ~4 radar units at ~$75, driving a multi-safety fail safe redundancy. As we go into 2020 and beyond with Level 4/5, we believe LiDAR will become more prominent in the vehicle but do expect to see further price declines on the units.

Exhibit 6: ADAS Sensors Content/Vehicle

ADAS System	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E
LiDAR ASP	$250	$225	$175	$150	$125	$100	$90	$85
Camera ASP	$120	$110	$100	$100	$100	$100	$100	$100
Infrared ASP	$15	$15	$10	$10	$10	$10	$10	$10
Radar ASP	$75	$75	$70	$65	$65	$65	$65	$65
Units/Vehicle								
LiDAR Units	0	0	4	4	3	3	3	3
Camera Units	3	3	2	2	2	2	2	2
Infrared/Ultrasonic Units	7	7	7	7	7	7	7	7
Radar Units	4	4	4	4	4	4	4	4
Cost/Vehicle								
LiDAR	$0	$0	$700	$600	$375	$300	$270	$255
Camera	$360	$330	$200	$200	$200	$200	$200	$200
Infrared	$105	$105	$70	$70	$70	$70	$70	$70
Radar	$300	$300	$280	$260	$260	$260	$260	$260
Total Sensor	**$765**	**$735**	**$1,250**	**$1,130**	**$905**	**$830**	**$800**	**$785**
ECU/Processor/Software	$200	$200	$300	$350	$350	$350	$350	$350
Multiple Domain Controller			$50	$100	$150	$150	$150	$150
Total Subsystem Cost	**$965**	**$935**	**$1,600**	**$1,580**	**$1,405**	**$1,330**	**$1,300**	**$1,285**

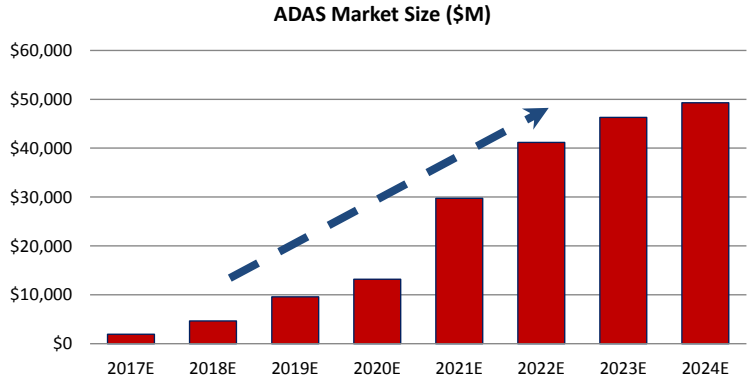


Source: Mizuho Securities estimates

Putting it all together – an ADAS market estimated at $30B by 2021E and $50B by 2024E. We believe the total fusion ADAS market including sensors (LiDAR/camera/radar) and the processing components required will be ~$30B by 2021E. We believe overall penetration in new autos with LiDAR should be ~20%, as consumer demand and NCAP regulations will push auto suppliers and manufacturers to offer ADAS as more of a "standard" feature. We are assuming a ~20% fusion LiDAR ADAS penetration by 2021E (~$29B market size), and ~36% penetration by 2024E (~$49B market size).

Exhibit 7: ADAS Market Growing to $30B by 2021E, $50B by 2024E

Automotive LiDAR/ADAS Market	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E
Total GaN/LiDAR Units per Year (M)	0.6	4.6	9.5	33.4	63.5	92.9	106.8	115.0
# of Units per Car	4	4	4	4	3	3	3	3
Est. Autos TAM (M)*	93	95	98	101	102	103	104	105
# of Cars w/LiDAR (M)**	0.2	1.1	2.4	8.4	21.2	31.0	35.6	38.3
LiDAR Auto Penetration	0.2%	1.2%	2.4%	8.2%	20.7%	30.0%	34.1%	36.4%
LiDAR ASPs ($)	$250	$225	$175	$150	$125	$100	$90	$85
LiDAR Market Size ($M)	$152	$1,032	$1,655	$5,015	$7,940	$9,290	$9,615	$9,779
# of Cars w/ADAS (M)***	2.0	5.0	6.0	8.4	21.2	31.0	35.6	38.3
ADAS ASP	$965	$935	$1,600	$1,580	$1,405	$1,330	$1,300	$1,285
ADAS Market Size ($M)	$1,930	$4,675	$9,600	$13,205	$29,748	$41,184	$46,293	$49,279



Source: Mizuho Securities estimates, EPC company estimates, *IHS estimates, **Mizuho estimates, ***Mizuho estimates, Radar+Camera, limited LiDAR 2017-19E

A look at some other third-party estimates on the ADAS market. Below, we take a look at other research and consulting firms and their outlook on the ADAS and LiDAR markets. As can be seen, estimates vary widely in both LiDAR (~$0.9B-$4.9B) and ADAS (~$11B-$168B). We believe that overall actual end-markets will be somewhere between the extremes. We would note however, that while we do not have detailed access to the reports, we believe each of these are calculated differently and include a number of different discrepancies from company to company. For your reference, we have laid out estimates by company.

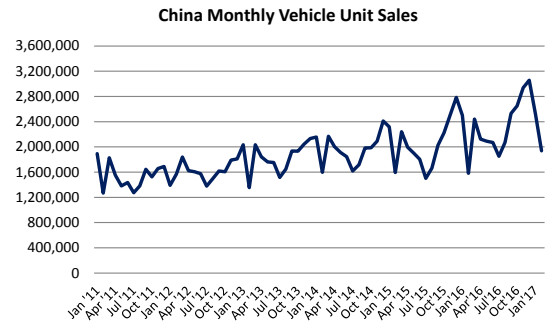
Exhibit 8: A Look at Third-party ADAS and LiDAR Market Estimates by 2022-25E

Research Firm		Market Size ($B)	By Year	Publish Date	Source Link
Research and Markets	LiDAR	$4.9	2025	Mar-17	PR Newswire
	ADAS	$168.0	2025	May-16	PR Newswire
Grand View Research	LiDAR	$1.3	2024	Oct-16	Grand View Research
	ADAS	$11.0	2022	-	Grand View Research
Markets and Markets	LiDAR	$5.2	2022	Mar-17	Markets and Markets
	ADAS	$42.4	2021	May-16	Markets and Markets
Allied Market Research	LiDAR	$0.9	2022	Apr-16	Allied Market Research
	ADAS	$60.1	2020	May-15	Allied Market Research

Source: Mizuho Securities research

A look at YTD global auto sales: China remains strong. After a period of suppressed growth for China, auto sales are continuing to show signs of a rebound with the 25% purchase tax cut on vehicles with under 1.6-liter engines. Sales in China were up 23% y/y in February. In 2016, China has only had one month of negative growth (-1% y/y for February). The monthly auto sales in China are now higher than U.S and Japan combined.

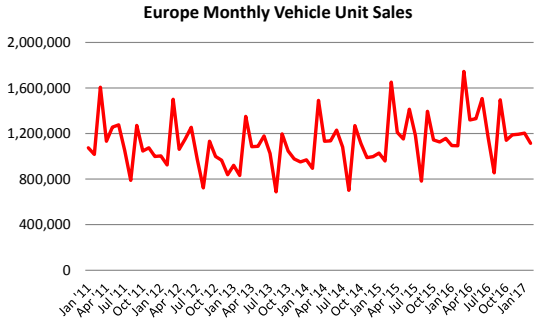
Exhibit 9: China Monthly Auto Sales 2011-YTD Feb/2012-YTD Feb Y/Y Growth

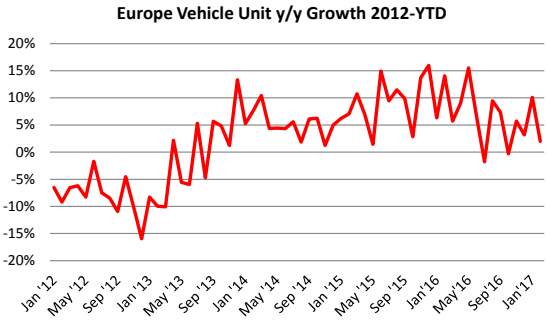


Source: Mizuho Securities estimates, Marklines

European car registrations remain stable to strong. European registrations continue to remain stable to strong in 2017after a solid 2016. In February, European registrations were up 2% y/y after being up 10% y/y for January. Despite economic concerns in the EU with Brexit, we continue to believe that sales should be ok moving forward.

Exhibit 10: Europe Monthly Auto Sales 2011-YTD Feb/2012-YTD Feb Y/Y Growth

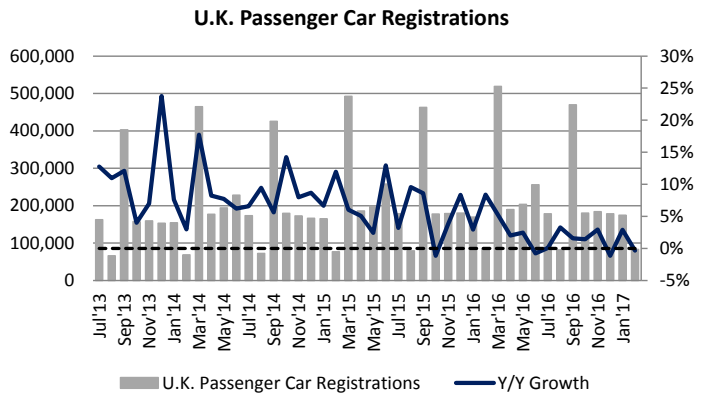




Source: Mizuho Securities estimates, ACEA

No signs of significant distress in the U.K. We believe it will be key to keep an eye on the U.K. post the Brexit vote, as the U.K. represents ~20% of total EU auto sales. Despite any potential concerns with Brexit, the U.K., while continuing to show signs of slowing, is flat to modestly growing. Since the vote, passenger vehicle registrations have been up y/y, averaging ~1%. **Registrations were up 3% y/y in January and flat in February.**

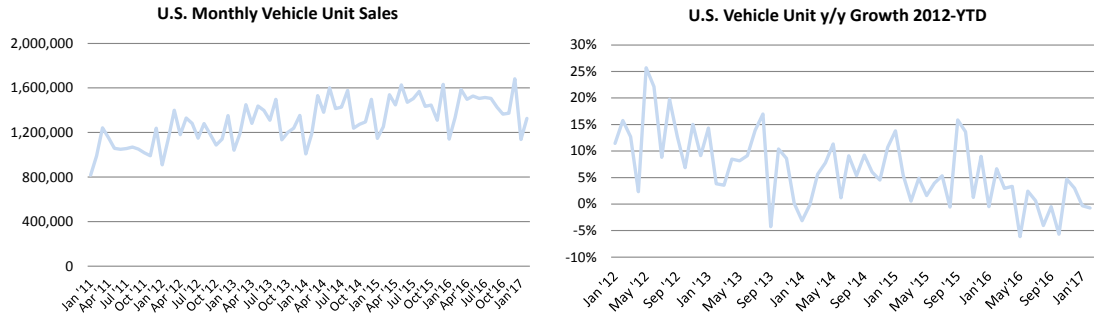
Exhibit 11: U.K. Passenger Registrations July 2013-February 2017



Source: Mizuho Securities estimates, ACEA

U.S. auto sales 2011-YTD flattish to slow. U.S. auto sales continue to show signs of peaking and potential retraction, though as we noted before multiple mandates with rear-camera ramping into 2017-19 and 2017 ramps with AEB imply positive upside from U.S. exposure for the automotive component suppliers. U.S. sales in February were down 1% y/y.

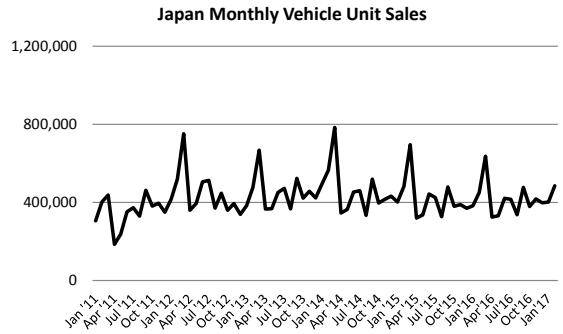
Exhibit 12: U.S. Monthly Auto Sales 2011-YTD Feb/2012-YTD Feb Y/Y Growth

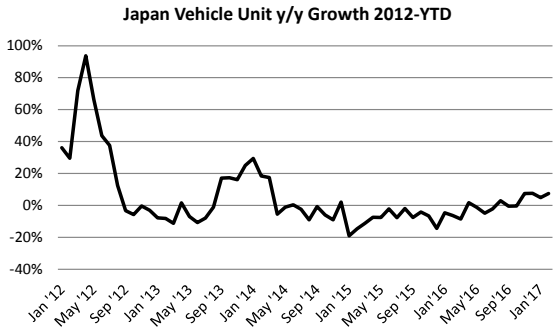


Source: Mizuho Securities estimates, WARD's

Auto sales in Japan showing signs of a rebound. Japan autos were on consistent declines for most of 2016 but began to show signs of a turnaround in November and December. Strength has continued into 2017 with January up 5% y/y and February up 7%. Average growth for the past 4 months is ~7% y/y.

Exhibit 13: Japan Monthly Auto Sales 2011-YTD Feb/2012-YTD Feb Y/Y Growth





Source: Mizuho Securities estimates, JADA

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XLV	***ADAS 2017 Another Step Closer; LiDAR Comes of Age***	***Jan. 12, 2017***
XLVI	***AI and Deep Learning; Primer to a Revolution***	***Jan. 18, 2017***
XLVII	***NVDA/Loop AI-DL Transforms Enterprise Intelligence***	***Feb. 16, 2017***
XLVIII	***Sensor Fusion for ASIL D; Move to LiDAR and Maps***	***Mar. 9, 2017***
XLIX	***A Look at the 2017 Huawei and China Handset Market***	***Mar. 9, 2017***

Glossary

~ - approximately
1H/2H - first half/second half
2G/3G/4G - 2nd generation, third generation. 4th generation wireless
3G/4G - Third generation / Fourth generation
4G-LTE - Fourth generation, long term evolution
ADAS - Automotive driver assist systems
APU - accelerated processing unit
ARM - a family of instruction set architectures used for processors for computers, servers, etc.
ASIC - application specific integrated circuits
ASP - average selling price
ATM - Asynchronous Transfer mode
B - Billion
BAW - bulk acoustic wave filters
BiDi - Bi Directional
BOM - bill of materials
bps - basis points
CA - carrier aggregation
CAGR - compound annual growth rate
CAPEX - capital expenditures
CDMA - code division multiple access
CEO/CFO - Chief Executive/Chief Financial
CES - consumer electronics show
CF - cash flow
CFIUS - Committee on Foreign Investment in the United States
COO - Chief Operation Officer
CSP - chip scale packaging
CY - calendar year
D/E - debt to equity
DCF - discounted cash flow
DoD - Department of Defense
DRAM - dynamic random access memory
DT - desktop
e.MMC - Embedded managed NAND solution
EBITDA - earnings before interest, taxes, depreciation and amortization
eMCP - embedded multi-chip module using DRAM and NAND
EMV - Europay, MasterCard and Visa, a payment consortium
EOY - end of year
EPS - earnings per share
ET - envelope tracking
ETD - Emerging Technologies Division
EU - European Union
EV - enterprise value
EvDO - Evolution Data Only
EVP - Executive Vice President
F - Fiscal
FASB - Financial Accounting Standards Board
FBAR - film bulk acoustic resonator, a type of filter
FBAR/BAW -Film Bulk acoustic resonator/Bulk acoustic wave Filters
FCF - free cash flow
FDD LTE - Frequency Division Duplex Long Term Evolution
FP - finger print
FPGA - field programmable gate arrays
FT - force touch
FTC - Federal Trade Commission
FY - fiscal/full year
GAAP - generally accepted accounting principles
Gb/GB - gigabytes/Gigabit
Gb/s - Gigabit per second
GF - Global Foundries
GHz - gigahertz
GM - gross margin
GPU - graphics processing unit
GSM - Global System for Mobile Communication
HDD - hard disk drive
HSA - heterogeneous system architecture combining x86 and ARM
HSD - high single digits
I/O - input output operations
IC - integrated circuits
IoT - internet of things
IP - intellectual property
ISM - Institute for Supply Management
ITU - International Telecommunication Union
JPY - Japanese yen
JV - joint venture
K - Thousand
Kbps/Mbps - Kilobit per second/Megabit per second bandwidth
KGD - Known Good Die
Kwpm - thousand wafer per month capacity
LIBOR - London Interbank Offered Rate
LQ - last quarter
LSD - low single digits
LT - long term
LTE - long term evolution, a 4th generation wireless protocol
LY - last year
m - Meters
M - Million
M&A - mergers and acquisitions
MB - megabyte
Mbps - megabit per second
MCU - micro controller unit
MHz - megahertz
MIIT - China Ministry of Industry and Information Technology
MIMO - multiple in, multiple out
MLC - multi level cell
MoE - merger of equals
MOFCOM - Ministry of Commerce People's Republic of China
MSD - mid single digits
MSM - multi station modems, QCOM's QCT chips
NAND - "not and," a type of memory
NB - notebook
NDRC - National Development and Reform Commission in China
NFC - near field communications
nm - nanometer
NOL - Net Operating Losses
NOR - a type of non-volatile storage memory
NPV - net present value
NVMe - Non-volatile Memory Express
NYSE - New York Stock Exchange
ODM - original design manufacturer
OEM - original equipment manufacturer
OFN - optical finger navigation
OLT - Optical Line Termination or Terminal
OM - operating margin
ONU - Optical Network Unit
Opex - operating expenses
P/B - price to book value ratio
P/E - price to earnings
P/S - price to sales
PA - power amplifier
PAD - power amplifier duplexer, essentially 2 filters and a Power amplifier
PC - personal computer
PCIe - Peripheral Component Interconnect Express
PMI - Purchasing Managers' Index
PMIC - Power Management Integrated Circuit
PoE - Power over Ethernet
PSD - Programmable systems division
PSoC - programmable system on a chip
PT - price target
Q - quarter
q/q - quarter over quarter
QCT - Qualcomm chip technologies
QTL - Qualcomm technology licensing
R&D - research and development
Rev - revenues
RF - radio frequency
ROI - return on investment
RSP - Renesas Semiconductor products/Drivers
RSU - Restricted Stock Units
SAS - serial attached SCSI (small computer system interface)
SAW - surface acoustic wave filters
SDH - Synchronous Digital Hierarchy, mostly in Europe
SG&A - Sales, General and Administrative
SLAC - subscriber line audio-processing circuit
SLIC - subscriber line interface circuit
SMIC - Semiconductor Manufacturing International Corporation
SoC - system on chip
SONET - Synchronous Optical Network, used in North America
SOX - Philadelphia semiconductor index
SRAM - static random access memory
SSD - solid state drive
TAM - total available market
TD - time division
TDDI - touch display driver integration
TDD-LTE - Time Division Duplex Long Term Evolution
TD-SCDMA - Time Division Synchronous
TLC - triple level cell
Tx/Rx - Transmit / Receive
USB - universal serial bus
wpm - wafer per month
x86 - Intel based processor architecture
XMC - Wuhan Xin Xin Semiconductor Manufacturing Corporation
y/y - year over year
YE - year end
YTD - year to date

Price Target Calculation and Key Risks

Autoliv, Inc.

Price Target. We have ALV with a Neutral and $115 PT, ~15.4x our F18E EPS. We believe that Autoliv is well positioned with its growing active safety segment and strong position is passive safety, but some NT headwinds in active safety and potentially slowing LVP keep us on the sidelines. We will review our rating and PT after 1Q results are released.

Risks. Autoliv competes in the very competitive automotive sector and any missteps can leave the company out of 2-4 year product cycles. The company also has a global footprint and faces currency uncertainty which can significantly affect topline results. Other risks include:

• Highly dependent on global light vehicle production

• Changes in component costs and raw material prices

• Pricing pressure from customers

• Potential failure of products and subsequent recalls

• Infringements on patents and proprietary technologies

• New Competition and pricing pressure from other low-cost OEMs, ODMs and suppliers

• Unexpected changes in legal and regulatory requirements, tariffs and exchange rates, political and economic stability, staffing and management issues, and potentially adverse tax consequences for its international operations

• Potential loss of intellectual property, Commercialization of competing technologies

• Litigation Risks and Adverse effects of potential possible future patent or other litigation

Cypress Semiconductor Corporation

Price Target: We believe CY is now a changed story, with a revenue focus on automotive and industrial, an automotive focused sales force, much less exposure to SRAM, continued fab consolidation with Fujitsu and Fab-4t on track with automotive qualifications and a dividend while you wait. CY's emerging technologies division is also starting to drive topline growth. Our PT of $16 is based on 14.7x our F18E EPS of $1.09.

Risks: CY competes in a cyclical, technologically intensive industry. Financial expectations and achieving future growth is subject to a number of risk factors, including, but are not limited to, the following:

Market Risks:

• Lumpiness in telecom and communication markets;

• Macro global slowdown, especially if the key U.S. economy is weak, impacting industrial, automotive and or weaker consumer spending; and

• Customer concentration, competition and pricing pressure from other low-cost OEMs, ODMs and suppliers and possible new market entrants from China, Asia-Pacific, or Taiwan.

Technology Risks:

• Potential loss of intellectual property and or commercialization of competing technologies;

• Successful integration and growth from Spansion acquisition;

• Litigation Risks - adverse effects of potential existing and possible future patent or other litigation.

Mobileye N.V.

Price Target: We have MBLY rated a Neutral with a $63.54 PT, ~42.1x our F18E EPS, the value of the pending INTC acquisition. While MBLY is dominant with its ADAS camera SoCs, we are staying on the sidelines as large Tier 1 OEMs look to bring camera in-house and other ADAS disruptors such as solid-state LiDAR players begin to move into the space.

Risks: MBLY competes in the quickly evolving and unforgiving world of autonomous driving, where errors, such as the Tesla accidents, can tarnish a company and emerging solutions can replace older technologies. MBLY also faces other risks including:

•Depends solely on STMicroelectronics to produce, test, and assemble its EyeQ SoCs

•Significant R&D investments with no assurance of design wins on new production models

•OEMs changing their ADAS technologies and moving away from MBLY products

•MBLY faces potential competition from a number of Tier 1 and other technology companies who may be current customers

•Currently solely dependent on mono-camera technology

NVIDIA Corporation

Price Target: While NVDA's valuations are steep, we believe current street estimates are conservative, reflect licensing slowdown, so that improving PCs, gaming trends, VR, and datacenter position for upside to estimates. NVDA is also well positioned for the up and coming machine learning, deep learning, and AI markets. Our NVDA F17/ F18(Jan) rev/EPS at $8.0B/$2.73 and $8.5B/$3.01 respectively. We have NVDA with a Buy-$130PT, ~43.2x F19E P/E, at the higher end of its historical valuations.

Risks. NVDA competes in a cyclical, technologically intensive industry and sells to a concentrated customer base. Its ability to meet its own or our financial expectations and achieve future growth is subject to a number of risk factors, including, but are not limited to, the following:

•Demand for NVDA’s products is variable and could differ from expectations;

•Gross margin percentage could vary significantly;

•Competition and pricing pressure from other low-cost OEMs, ODMs, and suppliers;

•NVDA relies on third party manufacturing;

•NVDA has a very high valuation, and investors are risk averse having seen significant resets in equities trading at high valuations such as AMBA and MBLY. We believe where NVDA differs is a significantly diversified revenue base, low customer concentration and conservative estimates. Also its expected catalysts are near-term, compared to longer-term growth objectives that have technology and regulatory risks.

•Unexpected changes in legal and regulatory requirements, tariffs and exchange rates, political and economic stability, staffing and management issues, and potential adverse tax consequences;

•Seasonal fluctuations associated with consumer products and the PC market;

•Potential loss of intellectual property, commercialization of competing technologies;

•Adverse effects of potential possible future patent or other litigation;

•NVDA receives a significant amount of revenue from a limited number of customers

NXP Semiconductors NV

Price Target: We have NXPI at a Neutral rating and a $110PT. Our PT is the QCOM acquisition price and represents a P/E multiple of 14.9x our post-FSL merger EPS of $7.38 and takes into consideration our expectations for approximately $2.8B of FCF. We believe that multiple product cycles with EMV, NFC, Automotive, synergies, execution and a focus on cash flow position NXPI well into 2017-18E.

Risks: Among the risks to our recommendation and price target are the following factors:

1) NXPI has high debt relative to peers;

2) NXPI has a big automotive exposure and any slowdown there could impact outlook;

3) NXPI has exposure in key cyclical NFC markets;

4) Other risks include competition, new technologies, IP, and licensing;

5) NXPI also has a significant exposure ~40%+ of revenues from China;

6) NXPI is also exposed to key smartphone cycles including Apple; and

7) NXPI competes in cyclical markets and is as such exposed to macro-economic, technology, competitive and litigation risks and also pending regulatory approvals on key mergers.

ON Semiconductor Corporation

Price Target: Our $18 price target is approximately ~12.4x our F18E EPS of $1.45. ON has been a show-me story given the challenges with Sanyo and the PC market, and we believe execution in the Automotive, wireless, and regaining share in the PC computing markets will be key to driving multiples higher. Near-term, strong market share in key automotive markets and ramp of new PC Skylake platforms positions well for ON.

Risks: ON competes in a cyclical technology intensive market and is exposed to macro-economic, competitive, litigation, market share, and other technology risks, including:

Market Risks

• ON's continued success of its research and development efforts and timely introduction and execution of its new wireless, computing, imaging and automotive products;

• Slower-than-expected ramp in wireless charging;

• Competitive pricing and market share pressure from Asia-Pacific, Taiwan, or China;

• Slowdown in the automotive market and industrial markets;

• Unexpected changes in legal and regulatory requirements, tariffs and exchange rates, political and economic stability,

• Staffing and management issues, Currency (Yen) and potentially adverse tax consequences for its international operations.

Technology Risks

• Potential loss of intellectual property.

• Commercialization of competing technologies.

Companies Mentioned (prices as of 4/03)

Autoliv, Inc. (ALV- Neutral $100.69)
Mobileye N.V. (MBLY- Neutral $61.25)
NXP Semiconductors NV (NXPI- Neutral $104.27)
Cypress Semiconductor Corporation (CY- Buy $13.51)
NVIDIA Corporation (NVDA- Buy $108.38)
ON Semiconductor Corporation (ON- Buy $15.07)

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Investment Risks and Valuation Methods can be located in the following section of this research report - Price Target Calculation and Key Risks.

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(As of 4/03)	% of coverage	IB service past 12 mo
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Hold (Neutral)	54.05%	36.53%
Sell (Underperform)	3.56%	45.45%

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