



Where **Analog** and **Value** Meet

Needham Automotive Tech Conference

June 3rd, 2020

www.towersemi.com

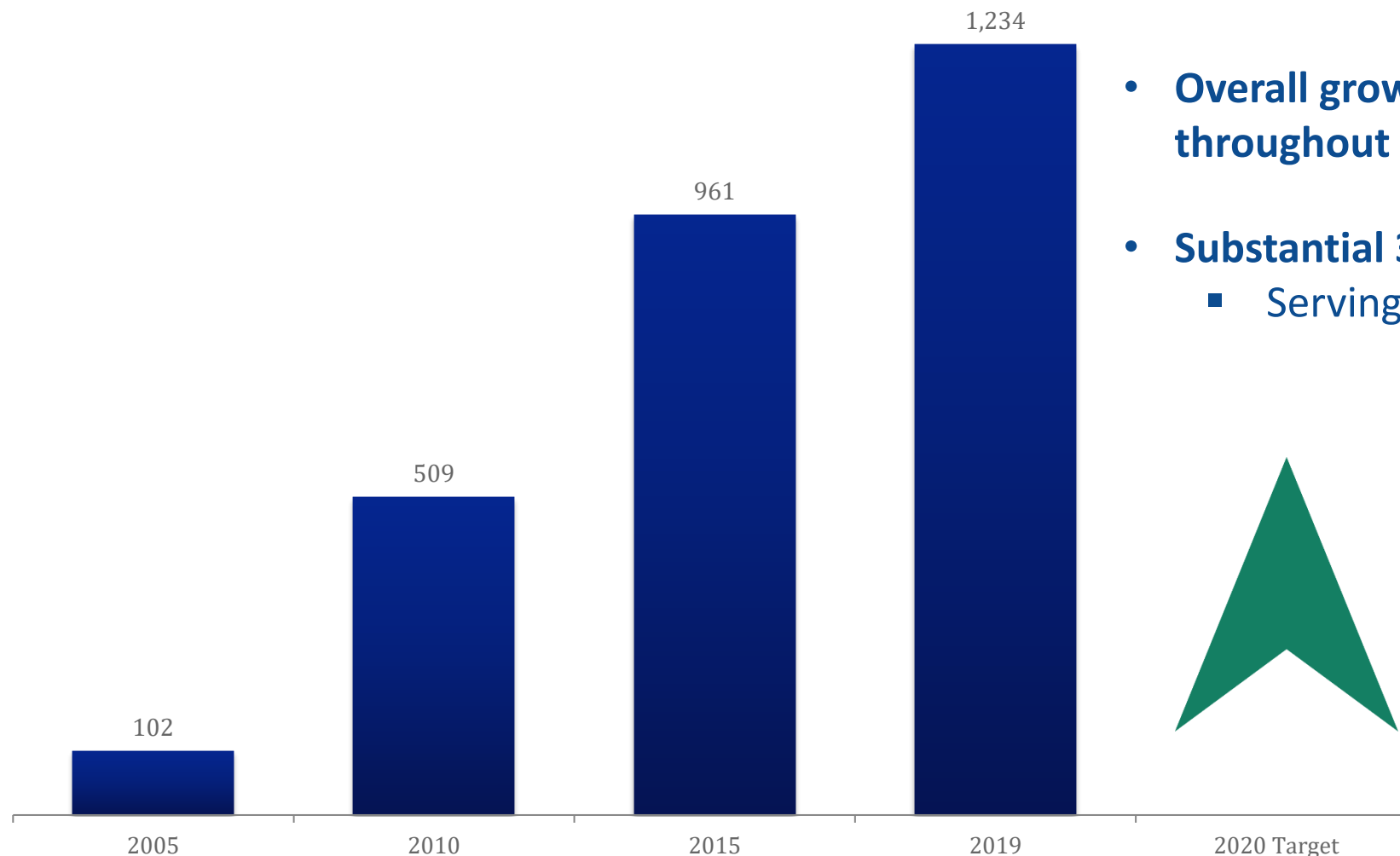


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This presentation contains forward-looking statements within the meaning of the “safe harbor” provisions of the Private Securities Litigation Reform Act of 1995. These statements are based on management’s current expectations and beliefs and are subject to a number of risks, uncertainties and assumptions that could cause actual results to differ materially from those described in the forward-looking statements. All statements other than statements of historical fact are statements that could be deemed forward-looking statements. For example, statements regarding expected (i) customer demand, (ii) utilization and cross utilization of our Fabs, (iii) demand from our end markets, (iv) market and technology trends, and (v) results regarding revenues, cash flow, margins and net profits are all forward-looking statements. Actual results may differ materially from those projected or implied by such forward-looking statements due to various risks and uncertainties applicable to Tower Semiconductor’s business as described in the reports filed by Tower Semiconductor Ltd. (“Tower”) with the Securities and Exchange Commission (the “SEC”) and the Israel Securities Authority (“ISA”), including the risks identified under the heading “Risk Factors” in Tower’s most recent filings on Forms 20-F and 6-K. No assurances can be given that any of the events anticipated by the forward-looking statements will transpire or occur, or if any of them do, what impact they will have on the results of operations or financial condition of Tower Semiconductor. In addition, some of the financial information in this presentation, is non-GAAP financial measures, including, but not limited to, EBITDA, Cash, debt and Net Cash. These non-GAAP financial measures have the same definition as appear in our previously filed quarterly financial results related announcements and/ or other public filings.

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Annual Revenues \$M – 5-year tracking – 2020 Target



- Overall growth with growth throughout the year
- Substantial 300mm capability
 - Serving all our business units

High Quality and Flexibility of Worldwide Manufacturing Capabilities



Migdal HaEmek, Israel

6", 150mm
CIS, Power
1μm to 0.35μm



Migdal HaEmek, Israel

8", 200mm
CIS, Power, RF SOI
0.18μm to 0.13μm



Newport Beach, USA

8", 200mm
SiGe, MEMS, RF SOI
0.5μm to 0.13μm



San Antonio, USA

8", 200mm
RF SOI, Power
0.18μm



Tonami, Japan

8", 200mm
Power
0.18μm



Arai, Japan

8", 200mm
CIS
0.13μm to 0.11μm



Uozu, Japan

12", 300mm
Power, CIS, RF SOI
65nm to 45nm

COVID-19: all seven fabs have continued to operate with good performance

Semi Market Trends

Wireless Everything
Seamless Connectivity



31% of corporate revenues

Green Everything
Energy Efficiency



38% of corporate revenues

Smart Everything
Interactive Smart Systems



15% of corporate revenues

2022 vs. 2019 Projected Growth of Tower's Served Market

44% FEM and Optical
50% with SiPho

22% PMIC and Discrete

32% traditional CIS and analog sensors
Hundreds % with VR/AR and display

Wireless Everything - Seamless Connectivity (31% of 2019 Revenue)

Wireless Front-Ends

SiGe and RF SOI



Optical Fiber Communications

HP SiGe and Si Photonics



RF SOI grew **40%** '18 to '19
Expect CAGR of 13% driven by 5G

>60% share of SiGe optical transceivers
Expect CAGR of 13% serving Telecom/Datacom

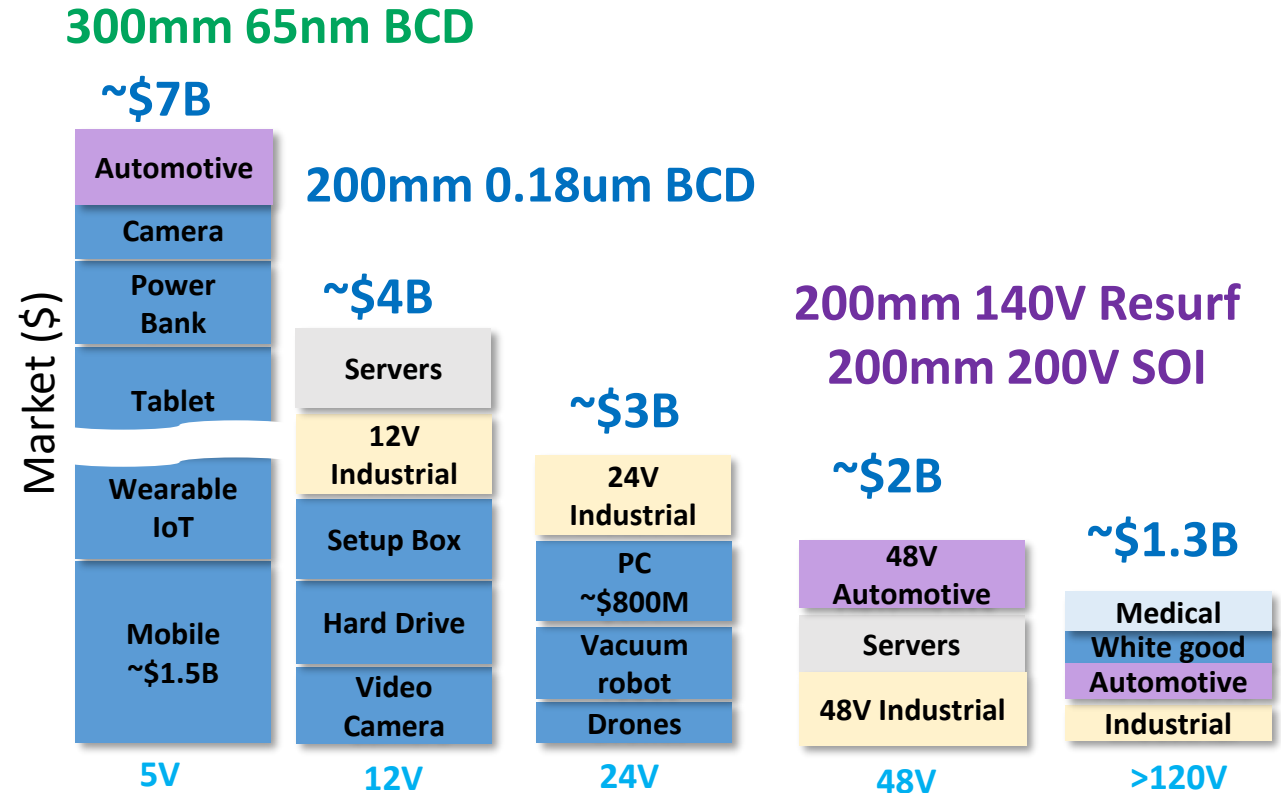
Green Everything – Energy Efficiency (38% of 2019 Revenue)

- **Power IC**

- Large market (>\$17B IC Sales)
- Recently released best-in-class technology across voltage and application range increasing our SAM
- Poised to take larger market share


- **Power Discretes**

- We serve 5 of the 6 leading discrete providers
- IP protection behind a firewall


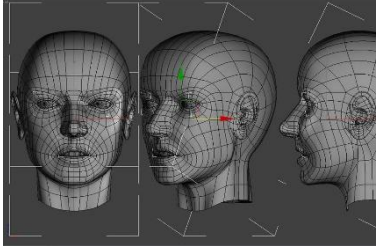



Smart Everything – Sensors (15% of 2019 Revenue)

• Tower Traditional Market

| | |
|--|---|
| Medical and Dental X-Ray  | <ul style="list-style-type: none"> • Growing market share • New 200mm and 300mm products introduction |
| High end Photography  | <ul style="list-style-type: none"> • New Cinema products • Growing market share with a leading DSLR maker |
| Industrial Machine Vision  | <ul style="list-style-type: none"> • Next gen products based on 300mm state of the art GS pixels |

• New Emerging High Growth Markets

| | |
|--|--|
| Under Screen Fingerprint  | <ul style="list-style-type: none"> • Customers providing to leading Chinese cellphone makers • Under OLED • Under LCD |
| Time of Flight  | <ul style="list-style-type: none"> • Two market leaders for face recognition ToF based solution |
| VR Displays  | <ul style="list-style-type: none"> • Market leader for VR goggles |

Semi Market Trends: Automotive

Wireless Everything
Seamless Connectivity



31% of corporate revenues

Green Everything
Energy Efficiency



38% of corporate revenues

Smart Everything
Interactive Smart Systems



15% of corporate revenues

Automotive: 10% of corporate revenues

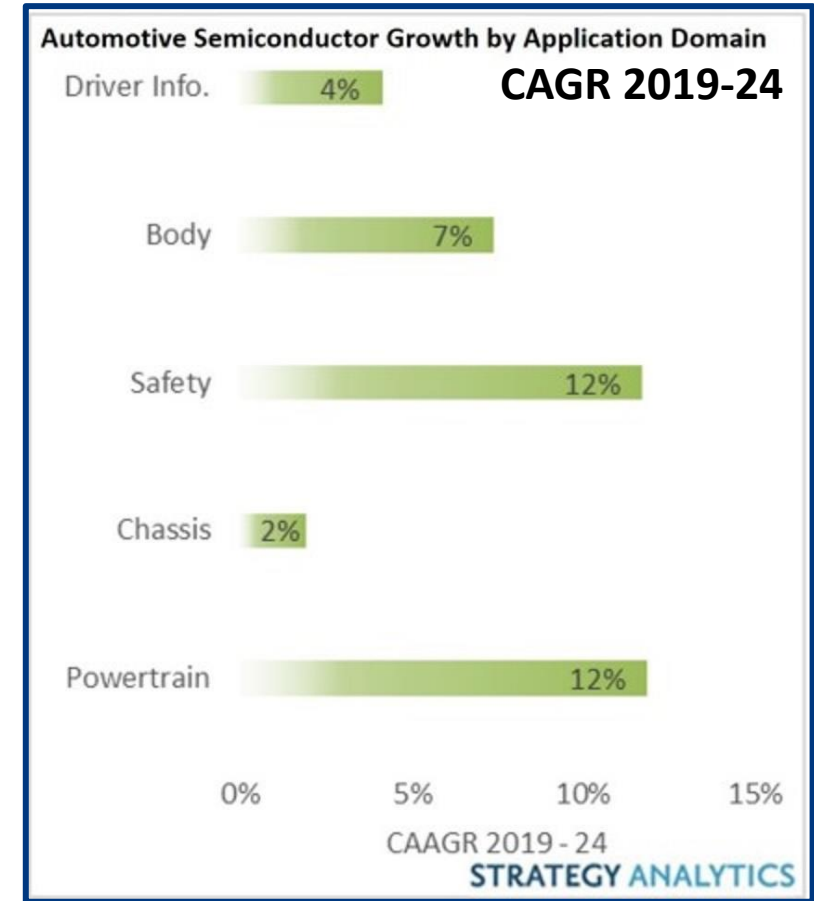
RF Radar (SiGe)
LiDAR (SiGe, SiPho)
Automotive Ethernet (SiGe, SiPho)

EV Battery Management
Power Drivers/Actuators
Power Management

Image Sensors
LiDAR

Secular Growth Drivers: ADAS (Safety) and Electrification

- Despite COVID-19, automotive semiconductor growth is projected to remain strong, driven by adoption of higher ADAS functionality (esp. Safety) and Electrification of powertrain
- With over **two-thirds** of Automotive IC content being Analog*, Tower Semiconductor technologies are well positioned to serve this growing market
- ✓ **RF-HPA** for Radar, LiDAR and automotive ethernet
- ✓ **Power** for Battery management and Powertrain
- ✓ **Imaging** for ADAS sensors
- **Accelerating** pace of innovation is increasing **outsourcing** to Foundry



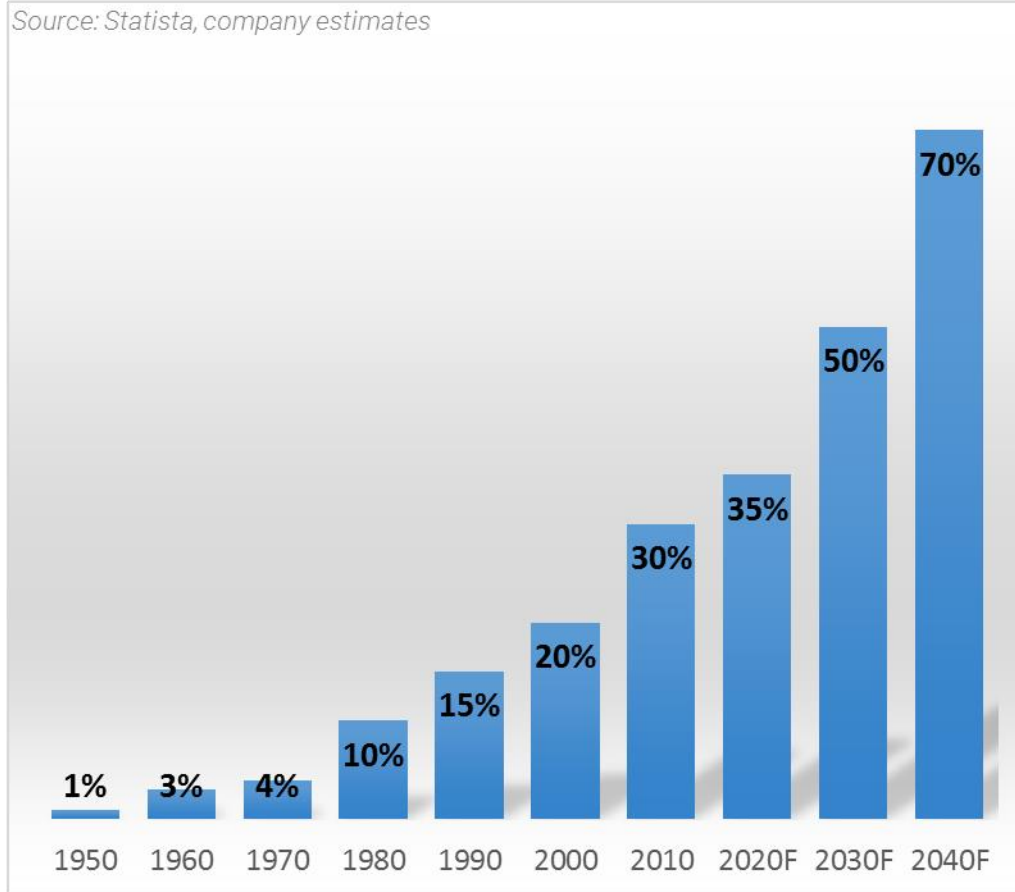
Strategy Analytics, May 2020

* Markets and Markets – including in “Analog” Power, RF, Sensors, MCUs and other Analog (excluding Processors, Memory)

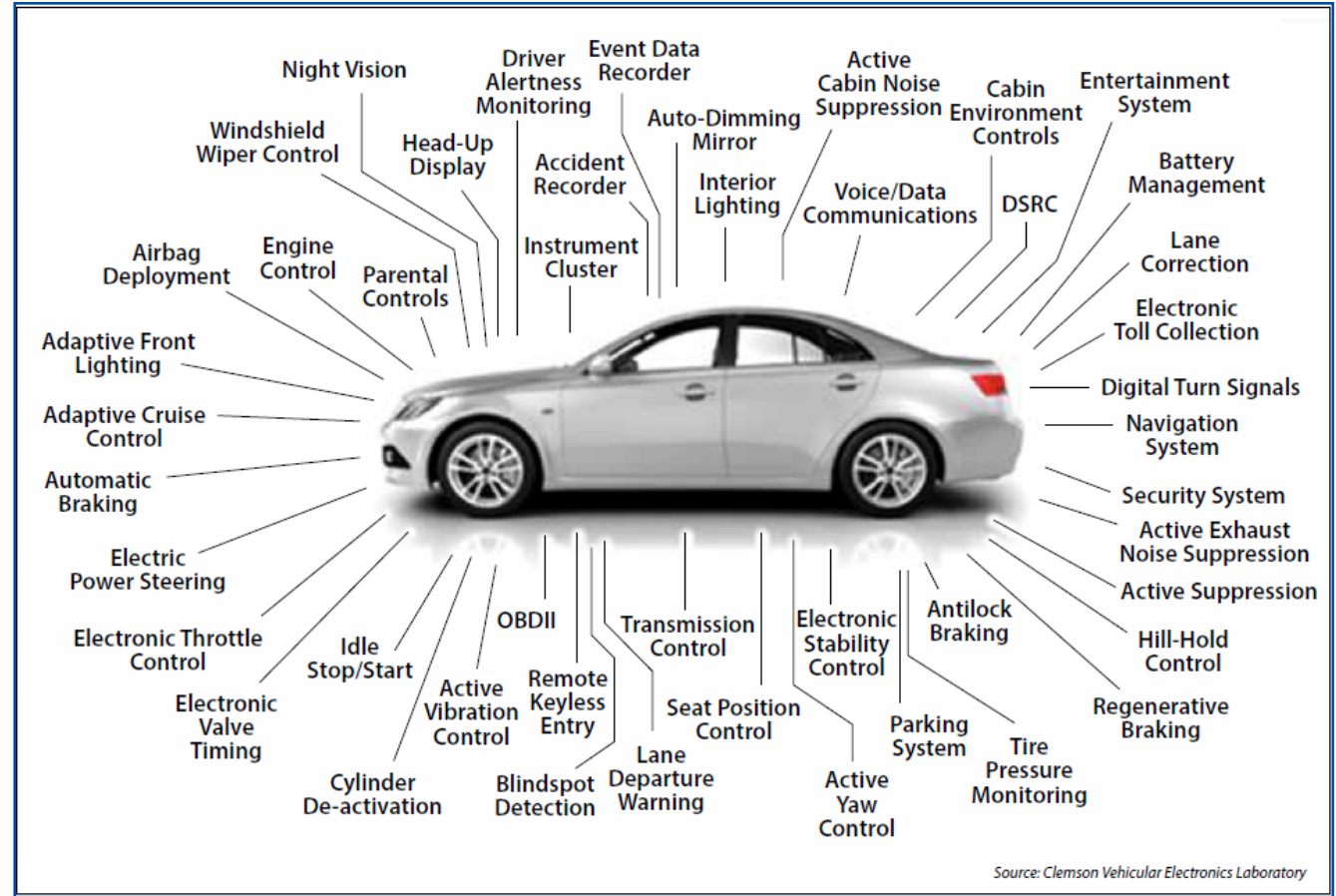
ADAS and Electrification Driving Electronic Content in Vehicles

Electronics as % of total cost of a car

Source: Statista, company estimates



Automotive Electronics Systems



Significant growth in semi content*: 2x growth from ICE to BEV and >8x growth from L0 to L4/5

* Automotive Semiconductors: The New ICE Age, KPMG (2019)

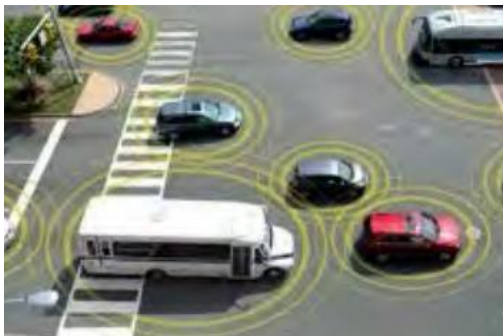
Future: Connected Automated Vehicle



Source: DKS

Autonomous Vehicle

Operates in isolation from other vehicles by using internal sensors



Source: DKS

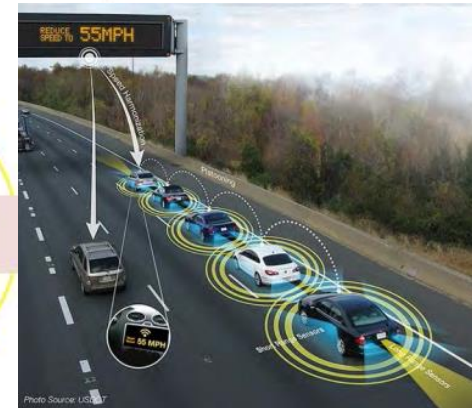
Connected Vehicle

Communicates with nearby vehicles and infrastructure



Connected Automated Vehicle

Leverages autonomous and connected vehicle capabilities



Source: DKS

the source : US DOT ITS-JPO

Analog Technologies for Connected Automated Vehicles **Served by Tower**

Application

ADAS: Radar, V2X Automotive Ethernet



RF & HPA

- RF-SOI
- RF CMOS
- SiGe BiCMOS
- III-V
- MEMS
- Silicon Photonics

ADAS: LiDAR, Camera & Night Vision IR



Light Sensing

- CMOS image sensors
- CCDs
- PIN
- ToF: SPADs (LiDAR)
- SWIR image sensors
- Thermal (IR) imaging

Diagnostic/Dynamics, Comfort & Convenience



Multi-Stimuli Sensing

- Magnetic TMR
- Biometric
- Inertial
- Temperature, Pressure
- Gas/Fluid
- Load, Torque, Speed

EV Battery Management & Powertrain



Power Management

- BCD (bulk, SOI)
- NVM
- MOSFETs
- IGBT
- GaN
- SiC

Technology

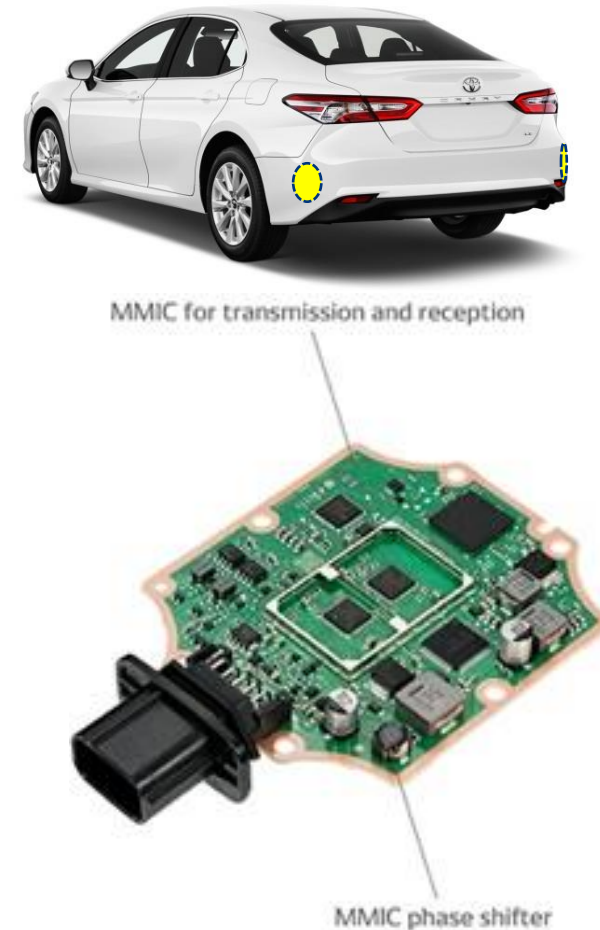
SiGe Sub-mm and mm-wave ICs for Radar, V2X and 5G Connectivity

Tower Semiconductor Announces DENSO Corporation utilized its Advanced 0.18um SiGe Technology to Develop a 24GHz Rear and Side Radar Sensor

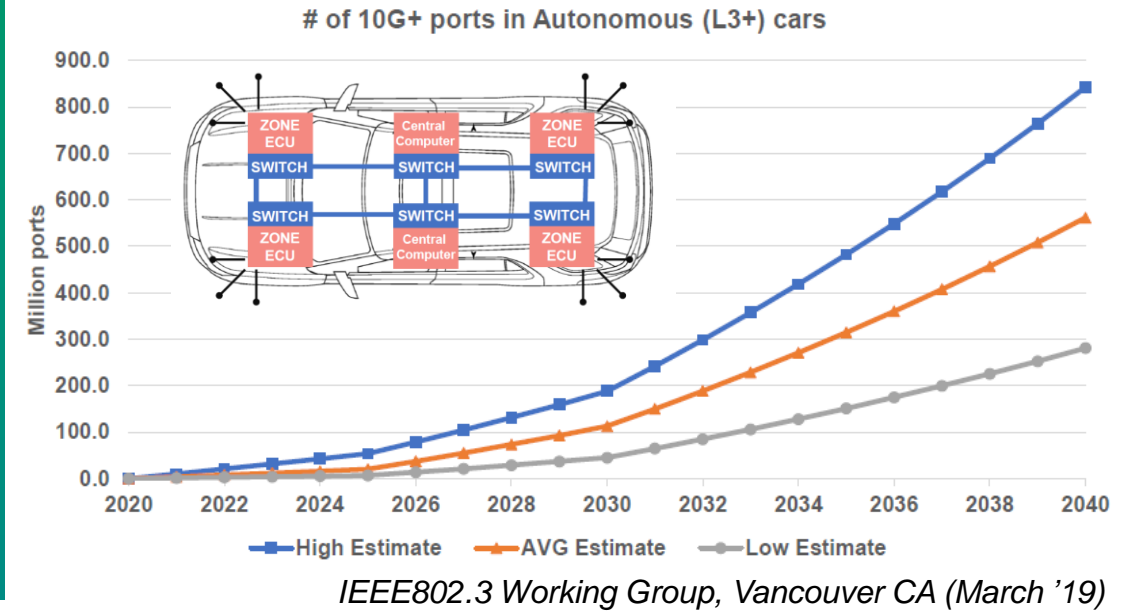
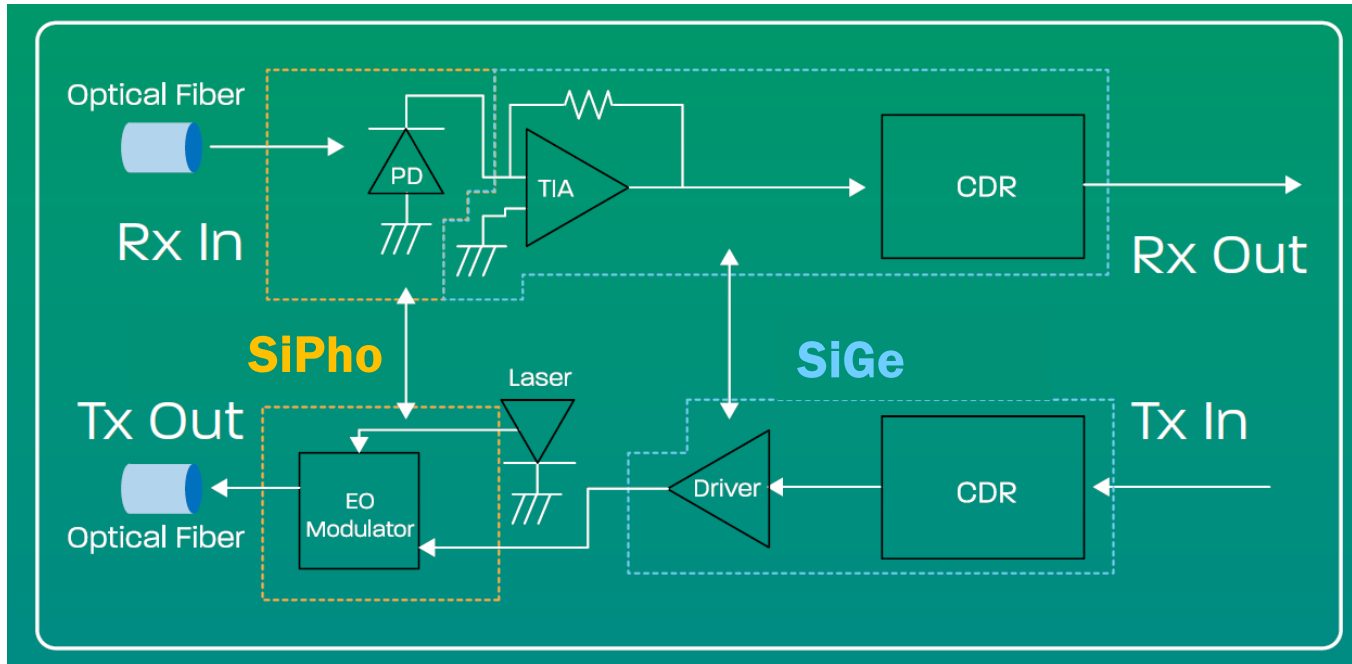
Automotive radar market estimated to grow from \$1.4B in 2014 to \$5B by 2023

MIGDAL HAEMEK, Israel, August 14, 2017 — Tower Semiconductor, the global specialty foundry leader, announced today that its 0.18um advanced SiGe technology was used to develop a 24-GHz rear and side radar sensor for DENSO Corporation, a leading supplier of advanced automotive technology, systems and components for major automakers. This sensor, using Tower's submillimeter-wave technology, is used in the Toyota Camry that was released in North America in July and it will help enhance the vehicle safety system.

DENSO's rear and side radar sensor system offers SRR (short range radar), enabled by Tower's advanced SiGe process, which helps alert the driver of vehicles approaching from behind when changing lanes and when reversing. It also helps perform automatic braking when reversing. According to Global Market Insights, the global automotive radar market size is estimated to exceed \$5 billion by 2023. The advent of self-driven cars is anticipated to drive industry growth over the forecast period.



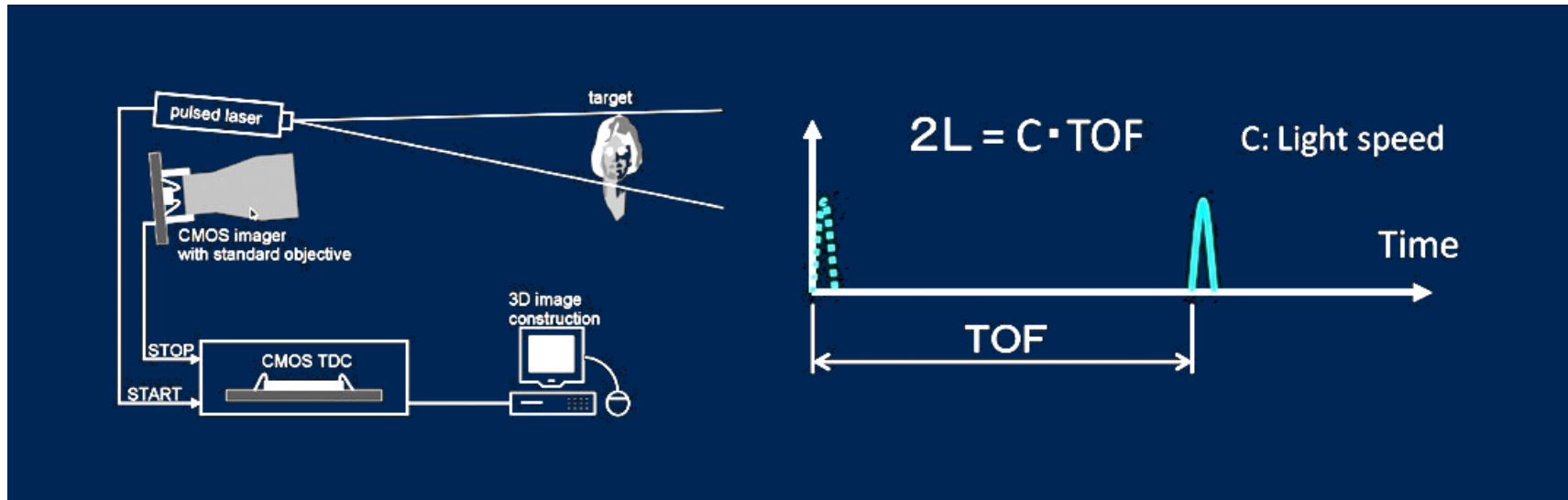
SiGe & SiPho for Ultra-Low Latency Automotive Ethernet



Centralized Sensor Fusion Architecture for L3+ vehicles would require low latency 10G and higher speed ethernet links between zonal ECUs

CMOS Image Sensors for Time of Flight Sensing

- Simple idea: Measure the time it takes for light to return from the object
- Two detection mechanisms that trade off between speed and signal-to-noise ratio (SNR)
 - **Active Gating:** Ultrafast Global Shutter (GS) technology for real-time imaging, but lower SNR
 - **Single photon avalanche diode (SPAD):** Highest SNR but relatively slower due to “quenching” required



Active Gated CMOS Image Sensor for Live Action Camera

BrightWay Vision Chooses Tower for the production of its Gated Sensor for Automotive Imaging Applications

Rapidly growing vehicle cameras market expected to reach over US \$1B in 2020, expanding at a CAGR of 11.3% from 2014 to 2020

MIGDAL HAEMEK and HAIFA, Israel, June 22, 2015 – Tower, the global specialty foundry leader, today announced that BrightWay Vision, a provider of groundbreaking vision technology for vehicles, has chosen its TS18IS CMOS image sensor (CIS) technology to manufacture image sensors for its patented automotive cameras, specifically forward looking cameras in vehicles, to allow visibility in all weather conditions. BrightWay Vision has developed BrightEye™, an Advanced Driver Assistance Systems (ADAS) camera for day and night-time forward facing driver assistance functions based on patented gated imaging technology.

According to a new market report published by Transparency Market Research entitled, "Vehicle Cameras Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2014 - 2020," the market was valued at US\$ 595.3 million in 2013 and is expected to reach US\$1.2 billion by 2020, expanding at a CAGR of 11.3% from 2014 to 2020



Courtesy of Brightway Vision

Tower's best-in-class **Global Shutter** pixel technology enables excellent visibility in adverse conditions



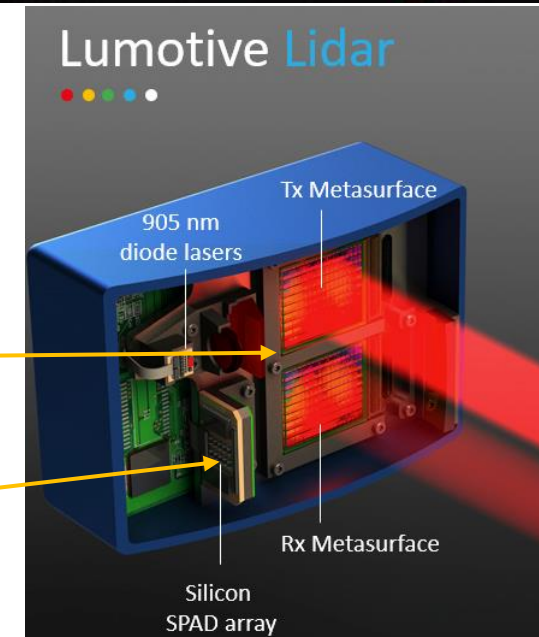
Breakthrough Solid State LiDAR Technology

Tower Semiconductor and Lumotive Demonstrate True Solid-State Beam Steering for Automotive LiDAR Systems

New IC is based on Lumotive's innovative Liquid Crystal Metasurface (LCM) technology, enabled by Tower unique process development capabilities

MIGDAL HAEMEK, Israel and Seattle, WA, June 26, 2019 – Tower Semiconductor, the global specialty foundry leader, and Lumotive, the Bill Gates-funded startup developing LiDAR systems for autonomous vehicles, today announced the successful demonstration of the first beam steering ICs for automotive LiDAR systems that are fully solid-state (without any moving parts). Based on Lumotive's unique liquid crystal metasurface (LCM) technology, the advanced IC is expected to deliver superior performance, reliability, and be more compact than competing beam steering solutions while providing longer range, fast response, high resolution, and wider projection angle.

Lumotive's breakthrough beam-steering ICs uses **Tower's 130 nm Cu back-end-of-Line technology, customized to meet specific optical performance requirements** with optimized lithography and custom dielectrics. Lumotive's complete LiDAR system based on this beam steering chip coupled with a custom SiPM (Silicon Photomultiplier) sensor, **utilizing Tower's cutting edge SPAD (Single Photon Avalanche Diode) technology**, will be available for prototype testing in late 2019.



Source: Lumotive

Tunnel MagnetoResistance (TMR) Sensors

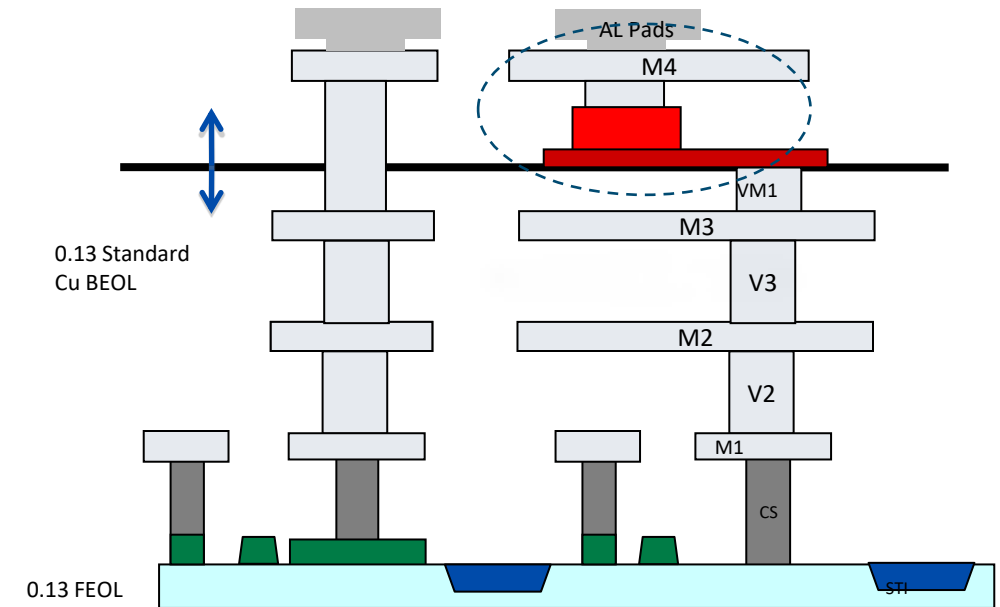
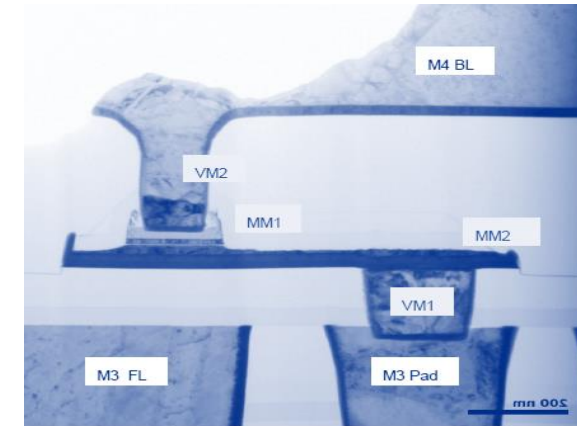
Magnetic Tunnel Junction (MTJ) Integrated in a Standard CMOS Process

Tower Semiconductor and Crocus Expand Presence in Magnetic Sensors Market through Successful Licensing of Crocus' IP and Volume Manufacturing by Tower

Crocus TMR sensors offer important advantages for multiple applications in IoT, consumer, automotive, industrial and medical sectors

MIGDAL HAEMEK, Israel and SANTA CLARA, Calif., September 27, 2017 — Tower Semiconductor, the global specialty foundry leader, and Crocus, a leading developer of TMR magnetic sensor technology and embedded MRAM, today announce volume manufacturing of Crocus TMR (Tunnel MagnetoResistance) sensors, using Tower's 0.13um CMOS process with a dedicated magnetic module in the Cu BEOL. With Crocus' magnetic process, know-how and IP, and Tower's process technology and integration expertise, Crocus has successfully licensed the TMR technology to an automotive Tier 1 customer, bringing increased business to both companies.

According to a 2016 MarketsandMarkets report, the overall magnetic field sensors market was valued at USD \$2.25 billion in 2015 and is expected to reach \$4.16 billion by 2022, at a CAGR of 8.87% between 2016 and 2022. The growth of this market is driven by the rising demand for MEMS-based sensors across industry verticals, surge in the automotive industry, increasing demand for high-quality sensing devices, and continuous growth in consumer electronics applications.

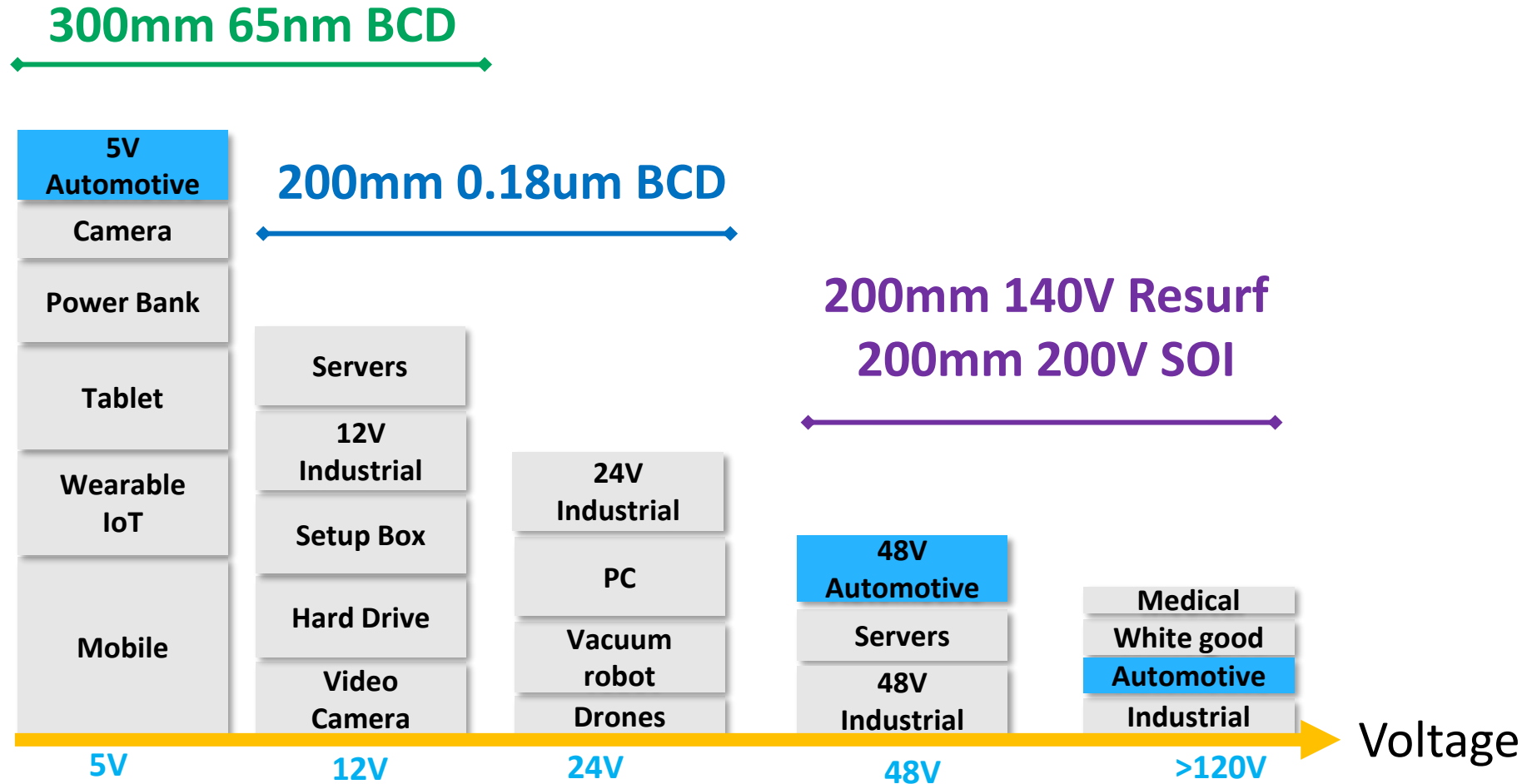


Source: Tower/Crocus



Power Management for Automotive

Best-in-Class application optimized BCD technologies across the entire voltage range.



High Voltage BCD Technology for Battery Management Systems

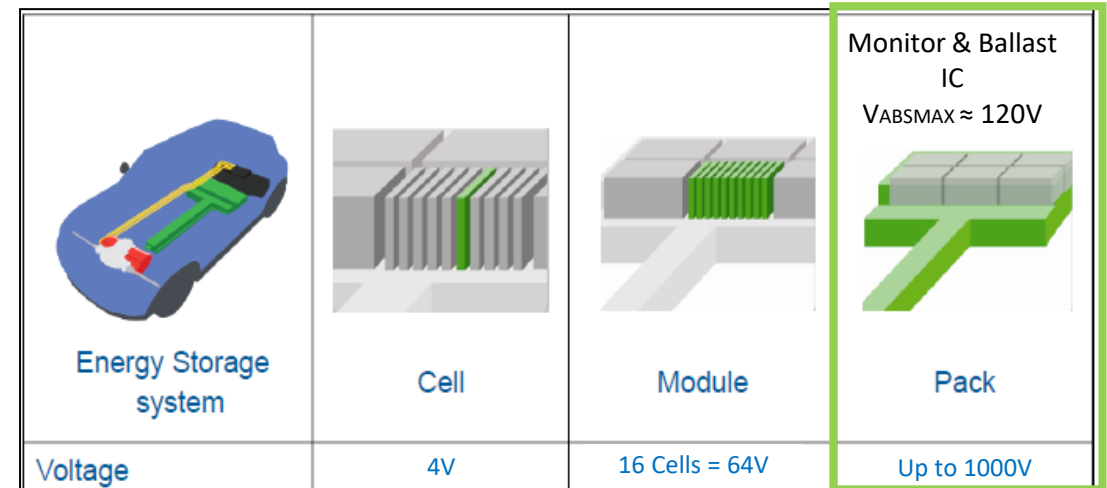
Tower Semiconductor Expands its Leading-Edge High Voltage Low RDS(on) Power Platform

Enabling applications with a voltage range of up to 140V

Addressing the fast-growing demand for higher voltage power management ICs in the consumer, industrial, computer and automotive markets

MIGDAL HAEMEK, Israel, June 17, 2019 – Tower Semiconductor, the global specialty foundry leader, today announced the release of its [leading edge 140V](#) low Rds(on) power platform, providing significant high power efficiency at high voltages. This advanced offering expands the Company's 90V technology platform, specifically designed to address the increasing demand for cost-competitive, higher voltage integrated power management solutions for the consumer, industrial, computer, and automotive markets.

"We are excited to announce the availability of our unique 140V RESURF low Rds(on) platform, targeted toward the expanding 48V ecosystem, serving multitude of market segments with numerous strategic customers already in early design stages, planning to ramp up to mass production in 2020," said Shimon Greenberg, Vice President of Power Management & Mixed-Signal/CMOS Business Unit, Tower Semiconductor.



- High volume 1.8V/5V bulk BCD Process with 140V floatability on an epi wafer
- Use junction isolation (non-SOI) to control cost
- Qualify platform for automotive Grade-0 in two fabs
- Common design platform (PDK) with accurate silicon-based models for time to market

Summary

- Despite temporary slow down in automotive market due to COVID, ADAS and Electrification remain strong secular trends for coming years, with a CAGR of 12%
- With best-in-class Analog technologies, Tower Semiconductor remains in a strong position to capitalize on the rapid growth in automotive semiconductor content



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Thank You

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