

Safer, greener and more connected: Smart Driving enabled by ST, today and tomorrow

Self-driving cars capture headlines, but their stunning science-fiction functionality is just part of the current revolution in automotive technology. Cars have shifted from a means of transport to a digital, fully connected object conceived with the complete user experience in mind, in which innovation is driven by electrical and electronic systems, with extensive connectivity and communication functions, as well as smartphone integration and remote control – all on the back of huge data processing capabilities. **The combination of the possibilities opened by these new technologies is creating what ST calls Smart Driving, with cars becoming safer, greener and more connected.**

The pervasion of technologies inside the car is reflected in the progressive rise in semiconductor content per car. From \$309 in 2015, the 2020 average is estimated at approximately \$333, a modest rise. However, premium models already feature a much higher silicon content today, estimated at an average of \$1200 per car in 2015, and the total is anticipated to rise to \$1330 in 2020.

ST has been supplying a broad range of electronic components to the automotive industry for over 30 years, which makes it a most credible partner not only to the traditional automotive suppliers and carmakers, but also to the newcomers, all of whom have long-term strategies with a relentless focus on quality and safety. .

ST revenues related to automotive systems were \$1.7B in 2015¹. ST is today the #1 chipmaker in braking systems, engine control, smart power, advanced driver assistance systems (ADAS), passive safety, car audio and #2 in infotainment². On average 30 ST components are found in each new car produced today.

¹ [MWC 2016 ST Investor Presentation](#) (February 23, 2016)

² Source: Strategy Analytics - Automotive_Infotainment_and_Telematics_Semiconductors_Q1_2016 (Jan 13, 2016)

SAFER CARS



Advanced driver assistance systems (ADAS) aim to drastically reduce road accidents and their casualties by helping drivers avoid accidents altogether. ST manufactures a wide variety of processors and sensors that are used in automatic braking systems, night vision, pedestrian detection, automatic cruise control systems, and more. These systems react faster than any human and can't be distracted.

ST today is a leading supplier of silicon to ADAS system manufacturers, notably thanks to its partnership with Mobileye, the world leader in vision-based safety systems³. In 2015 ST held a 29% market share in ADAS, and 68% of the market for vision systems.

ST is also a leading supplier of radar sensors⁴ – well-established in short-range radar and starting strong in long-range radar – and motion sensors for passive safety systems as well as intelligent braking and stability control.

Car-to-car and car-to-infrastructure (“V2X”) systems are now being trialed with ST technology and will be rolled out on a massive scale, enabling better traffic management which will also prevent accidents.

ST is also playing a leading role in **reinforcing the physical and cyber security of the car's systems**⁵, with processors embedding dedicated security and fail-safe features, as well as secure modules to protect critical systems of the car and prevent hacking.

GREENER CARS



³ [MWC 2016 ST Investor Presentation](#) (February 23, 2016)

⁴ <http://www.st.com/web/en/press/p3809> (February 23, 2016)

⁵ <http://www.st.com/web/en/press/p3801> (February 23, 2016)

Advanced engine-management systems have slashed CO₂ emissions and drastically boosted engine efficiency in the past decades, but there's still room for improvement, in engine management, transmission as well as in charging for HEVs and EVs.

Our latest microcontrollers (processors optimized for automotive systems management) **can precisely control every aspect of combustion, from intake to exhaust to optimize efficiency even more**⁶. They can also be used in advanced compact turbocharged or supercharged engines where precise timing and processing speed are crucial. They also consume less energy than previous systems, increasing overall system efficiency.

We have also increased the speed and efficiency of our analog components (BCD and VIPower actuators) to give automotive engineers greater control over the combustion cycle.

All these technologies have tremendous potential to extend the practical life of the internal combustion engine for personal transportation. The future, however, is electric vehicles on a mass scale. So we're currently refining and developing systems to further support electric vehicle power management and storage.

With its power management components ST is addressing today the **key power sub-systems in hybrid-electric and electric cars**: the on-board battery chargers, DC/DC converters, the main traction inverters and 48V systems. These power components are often paired with microcontrollers, such as in the latest Toyota Prius platform⁷. The complete solutions include battery management custom chips and microcontrollers, as well as a broad range of power components (MOSFETs, rectifiers, SiC diodes, GAPdrives, IGBTs...)

⁶ http://www.st.com/web/en/catalog/sense_power/FM2098/SC963

⁷ <http://www.st.com/web/en/press/t3754> (December 10, 2015)

MORE CONNECTED CARS



Gone are the days of the simple AM/FM radios being a car's only connection to the outside world. **Connectivity is one of the key visible changes brought by digital technologies into the automotive industry.** This connectivity not only gives drivers up-to-date traffic info, directions, and entertainment, but it can also help relieve traffic congestion and improve safety.

Standard AM/FM radios are being augmented with Software Defined Radio. Onboard infotainment systems are also handling powerful audio/video processing and secure gateways for data transmission. **It all means more processing power, navigation technologies, and secure communication links.** ST has a broad portfolio of components for automotive infotainment and communication: dedicated processors and amplifiers for fully digital audio, and infotainment clusters⁸, including some enabling smartphone replication, telematics processors, multi-standard positioning (GNSS)⁹, memory interfaces, multi-standard tuners, decoders, and more.

In the future, these same systems will also allow cars to communicate with each other and the road and transport infrastructure itself. It's called **Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication**, a key step in making autonomous cars a reality. With it, cars will be able to communicate with each other and systems embedded in the road infrastructure to gather information about traffic, weather, and more. These self-driving cars could use the information to reduce or increase speed on highways to avoid congestion. ST is preparing for the mass deployment of V2X and works with Autotalks to have a chipset ready for mass deployment in 2017¹⁰, while many field-application trials are ongoing across the world.

⁸ <http://www.st.com/web/en/news/n3739> (September 30, 2015)

⁹ <http://www.st.com/web/en/press/p3721> (September 28, 2015)

¹⁰ <http://www.st.com/web/en/press/t3724> (October 1, 2015)