Image sensing at the core of the ADAS revolution

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The life history of passenger cars has seen 100s of innovative ideas, systems and features develop and become a part of the standard make-up of the vehicles we drive today. Along the way, several major features stand out that have given quantum leaps in performance, comfort and convenience or safety. Good examples being turbochargers, fuel injection systems, navigation and infotainment, airbags and anti-lock braking. The latest acronym, which is an umbrella term for an array of features, is ADAS or Advanced Driver Assistance Systems. These systems are being developed to assist, complement and eventually substitute the driver, mitigating for the risk of human loss of concentration, misjudgment and fatigue. A key feature of future applications that can be considered as ADAS is image sensing, therefore the continuing rapid technological advancement of CMOS image sensing is a key enabler for systems that will, in the coming years, see the next quantum leap in passenger cars as we know and understand them.

The near future (2017/18 timeframe) will see the fusion of existing ADAS with viewing and image sensing to support the realisation of highly dependable systems that take partial control of vehicle movements based on real events or the prediction of situations. Automatic interventions for braking and steering based on image sensors as well as other component (LiDAR, RADAR) information will prevent accidents and ultimately completely change the way we drive and travel with the end scenario being fully autonomous cars. For those who enjoy the interactive 'thrill' of driving, this may not all be good news, but the massive changes looming will be welcomed by most who just want to get from A to B as quickly as possible and with the utmost comfort and safety.

Automotive Safety Integrity Level (ASIL), a risk classification scheme defined by ISO 26262, will be the compliance and suitability reference point for new systems as existing ADAS and 'viewing' applications merge to allow the implementation of functionality such as collision avoidance and electronic braking that is able to truly take control of the vehicle. ASIL has four levels (A to D) representing increasing degrees of automotive hazard and the rigour required in the associated safety systems; D is the most stringent. ASIL B compliance is the objective of ADAS designers at present with European New Car Assessment Programme (Euro NCAP) also set to define safety performance levels in the near future. In order to achieve the required performance and reliability for ADAS, the frame-by-frame and block-by-block performance of CMOS image sensors used must be ultra-dependable. This need is accentuated by their position right at the beginning of the 'process.'

Automotive applications are typified by operating environments and conditions that are tough. Temperature, vibration, moisture and electromagnetic interference (EMI) are just a few of the factors that threaten long-term performance of electronic components used in the various vehicles systems – ADAS included. As the market for active safety proliferates and the fusion of vision and ADAS with other components gathers pace, ON Semiconductor will continue the evolution of image sensors with features to meet the challenges of next generation ADAS systems for the enablement of ASIL system compliance.