

# The role of NAND flash in emerging connected automotive applications

*The increase in complexity of automotive applications will require more sophisticated and accurate solutions. The Internet of Vehicles (IoV) era is bringing the need for enormous data processing and I/O among objects and underlining the importance of data integrity. This article shows how high performance and high capacity NAND flash storage will enable the benefits of IoV.*



The automotive industry is moving to a new era with the driving force of the Internet of Things. The Internet of Vehicles (IoV) defines the increasing importance of not only solid connectivity but also abundant data processing amongst vehicles at various stages. Over the years these stages have been evolving from passive safety, active safety, connected vehicle (V2X) and future-trending autonomous vehicle; the level of automation involved is increasing accordingly. Simultaneously, the core of development stages highlights the demands of effective and accurate information transmission and data processing in the network of relevant objects. In pursuit of real-time responsiveness, data accuracy and consistency, data integrity is primarily required through the entire operation process – input, process and output; the need for high performance and high capacity storage devices is ever-increasing.

To cope with emerging automotive applications and technology, NAND flash devices play a critical and fundamental role. Compared to conventional applications, at the present IoV development stage industry applications, such as remote, infotainment service and ADAS (Advanced Driver Assistance Systems), mainly target data exchange/process to optimize the in-vehicle experience and connectivity with external environmental objects. ADAS are classified as diverse subsystems according to their functions. Of these, the Driver Monitoring System (DMS) helps

detect driver facial expressions and mitigate the possibility of life-threatening incidents by image capture (camera input). This real-time system with developed algorithms will trigger alerts in the HUD as soon as driver fatigue and distraction is detected via expression interpretation. The Connected Car concept depicts the new leap in innovation in the automotive industry. Anticipating more data processing and effective communication protocol switching, storage devices with higher capacity and endurance advance the requirement of connected technology.

Those applications are sensor-based (radar or camera) and with data-intensive features. A series of operation processes from perceiving external data, processing data and subsequently taking actions based on computerized results requires storage devices with a high level of write/read intensive performance. Based on customer mission profiles in actual cases (shock/vibration/storage lifetime/performance test etc.), ATP architects purpose-built solutions and provides customer-oriented service packages. Apart from common large-file data (e.g. graphic capture) accessed sequentially, the challenge for write-intensive operation is to mitigate the impact on endurance and service life of memory resulting from high write amplification when writing small-file data (e.g. log files). As a result, S.M.A.R.T./SD Life Monitor, a health status monitoring tool, assists storage lifetime detection and provides early warnings to pre-

vent wear out/spare block exhaustion. ATP implemented Wear Leveling enables to even the erase count of all blocks and to extend the life expectancy of NAND flash storage.

For an array of conventional read-intensive applications, such as the navigation system, the emphasis on sustaining data integrity is key. ATP AutoRefresh is able to optimize read-only applications by moving data into new blocks prior to possible data loss and corruption. For seldom accessed areas, Dynamic Data Refresh is activated in the background to reduce the risk of disturbance from every read operation and to further sustain data integrity.

With respect to wide-ranging automotive applications, ATP offers the all-inclusive Automotive Solution Set, covering quality, manufacturing, testing, engineering and supply chain capabilities. The requirements for automotive applications call for storage devices with features such as high and consistent performance, durability, and reliability in extreme operating conditions. To meet industry requirements and standards, ATP has been assessed and has obtained certifications for ISO/TS16949, ISO9001 and ISO14001 for product quality control. Apart from that, ATP includes IVI test plan with AEC-Q100 compliant test items and performs stringent software joint development/integration and head-unit joint validation tests to optimize product quality. ■