

How to Sustain the Expected TPMS Battery Life

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Freescale has combined advanced MEMS technology with an 8-bit microcontroller and RF transmitter to create a versatile, single-package tire pressure monitoring system (TPMS). This industry first, measures wheel rotation and speed direction. The entire TPMS system takes advantage of these MEMS-based systems and the architecture and improves power consumption efficiency. The system differs from other monitoring systems by taking advantage of MEMS capacitive sensing technology rather than the piezoresistive alternative which is essential for low power battery driven applications such as TPMS. This TPMS solution uses direct tire pressure monitoring rather than the indirect method. This approach has significant advantages that will be presented.

This presentation will address the main challenge of every automotive TPMS module designers: How to sustain the expected battery life of eight to ten years. The TPMS system functional blocks and interrelations will first be presented. How this level of integration is achieved will be briefly explained with different sensor technologies.

We will then analyze the lifetime a TPMS module. Several actions within TPMS are events that repeat throughout its lifetime: sensor measurements, RF transmissions, LF monitoring, CPU execution time. Each event may vary with application and device configuration. Monitoring systems also operate in different modes: standby, vehicle parked, in motion at low or high speed. We will then make assumptions in order to draw a typical TPMS module operational lifetime model that we will call mission profile.

This mission profile will allow us to evaluate and improve the power consumption efficiency of a TPM system design (hardware and software). This model will also allow us to compare the resulting performance of different TPMS semiconductor solutions available on the market. The relative importance of their operational parameters will be measured. We will also draw some power consumption reduction strategies for monitoring systems.

This presentation would give TPMS system developers the tools they need to efficiently select the best building components of the next TPMS system design while best evaluating system power consumption performance.