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An Approach to the Safety Design and Development of a Brake-by- Wire Control System

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ABSTRACT

The increasing usage of brake-by-wire systems in the automotive industry has provided manufacturers with the opportunity to improve both vehicle and manufacturing efficiency. The replacement of traditional mechanical and hydraulic control systems with electronic control devices presents different potential vehicle-level safety hazards than those presented by conventional braking systems. The proper design, development, and integration of a brake-by-wire control system requires that hazards are reasonably prevented or mitigated in order to maximize the safety of the vehicle operator, occupant(s), and passers-by. The purpose of this paper is to discuss an approach to the design, development, and integration of a brake-by-wire control system from a safety perspective, which includes a method to:

- Identify the potential system hazards
- Determine the component failure combinations that can lead to a system hazard
- Analyze the component failure modes and the design controls used to prevent and detect those failure modes
- Correlate the failure prevention and detection methods to the program-defined subsystem requirements
- Define an on-target validation plan to confirm the proper system reactions for each failure mode

Summarize the system hazards and the strategy, mechanisms used, and system implementation for the prevention and mitigation of those hazards