

ABSTRACT

The development of autonomous electric vehicle technology demands reliable and safe electronic systems, especially in braking control. The Electronic Control Unit for the Brake-by-Wire system (ECU-BBW) plays a role in managing sensor signals and controlling the brake actuator precisely. However, the ECU-BBW is susceptible to electromagnetic noise that reduces signal accuracy and affects system safety. This research aims to develop a more reliable and interference-resistant ECU-BBW by implementing an isolated power supply. The methods used include hardware design with galvanic isolation between the control circuit and the actuator power, as well as PCB layout optimization through the use of a solid ground plane and reduction of the sensitive signal loop area. The resulting discrete-isolated ECU-BBW prototype (B1) is able to suppress noise, improve sensor reading stability, and strengthen the module's resilience to electrical interference. The implementation of an isolated power supply improves the signal-to-noise (S/N) ratio of the control angle from 26.9 dB to 41.9 dB, the brake pressure from 10.42 dB to 14.55 dB, and the motor current from 17.42 dB to 17.82 dB. These results demonstrate better signal integrity and consistent actuator response, resulting in a more precise and safe braking system in small-scale autonomous electric vehicles such as Autonomous Golf Cars (MGOs)..

Keywords: *brake-by-wire, ECU-BBW, noise, Autonomous Golf Car (MGO)*