Assignment: Active EMI Filtering for Compact Electronics

Type: Internship / Graduation Project

Discipline(s): Electrical Engineering / Power Electronics

Level: Bachelor

Assignment description

Can active EMI filtering help make AME electronics more compact? You will investigate active electromagnetic interference (EMI) filtering using a Texas Instruments IC, with TI application note SLYT812 as your starting point. You will explore how the technology works, where it offers an advantage over conventional passive filtering, and how to integrate it into a practical design.

Assess the potential for reducing EMI filter footprint in four AME application types:

- Motor drive with power factor correction (PFC).
- Flyback switched-mode power supply (SMPS).
- Charging power converter.
- Digital board.

Together with your supervisor, select the most promising application for prototype development and testing.

Objective

Develop and demonstrate an active EMI filter integrated into a representative AME design. Compare it with the existing passive filter and determine whether it can reduce total filter footprint while maintaining the required EMI performance and safe, reliable operation. Provide practical guidance on when and how AME should use this technology.

Tasks

- **Explore:** Study TI application note SLYT812 and relevant IC documentation. Investigate the operating principle, common-mode and differential-mode applicability, frequency range, supply requirements and limitations.
- **Assess applications:** Review the four application types with AME engineers. Identify noise sources, existing filters, interfaces and constraints. Rank the opportunities and select a suitable prototype application.
- **Establish a baseline:** Measure the existing design's conducted emissions and record filter footprint, component height, cost and operating conditions. Agree the applicable limits, target reduction and test conditions with your supervisor.
- **Design and integrate:** Select a suitable TI IC and design the active filter, including the remaining passive components. Develop the schematic and PCB layout, considering stability, grounding, parasitics, safety clearances and leakage current where applicable.
- **Build and test:** Build a prototype and compare the original filter, active filtering enabled and active filtering disabled. Test representative input and load conditions, startup and relevant fault

behaviour. Check that improvements in one frequency range do not introduce problems elsewhere.
- **Evaluate and hand over:** Quantify the net footprint reduction, including the IC, supporting components and required clearances. Explain trade-offs in cost, power consumption and complexity, and document where the approach is beneficial or unsuitable.

Project resources

- TI application note SLYT812 and relevant IC documentation.
- Representative AME designs and existing filter information, subject to availability.
- Collaboration with electronics, power electronics and EMC specialists.
- Prototype facilities and suitable EMI measurement equipment, to be agreed with the supervisor.

Key deliverables

- Feasibility assessment covering all four application types and a justified prototype selection.
- Baseline measurements and agreed performance targets.
- Integrated prototype, schematics, PCB layout and bill of materials.
- Comparative test report covering EMI performance, total filter size and implementation trade-offs.
- Practical selection and design guidelines for future AME applications.
- Design files, measurement procedures and a final internship report.