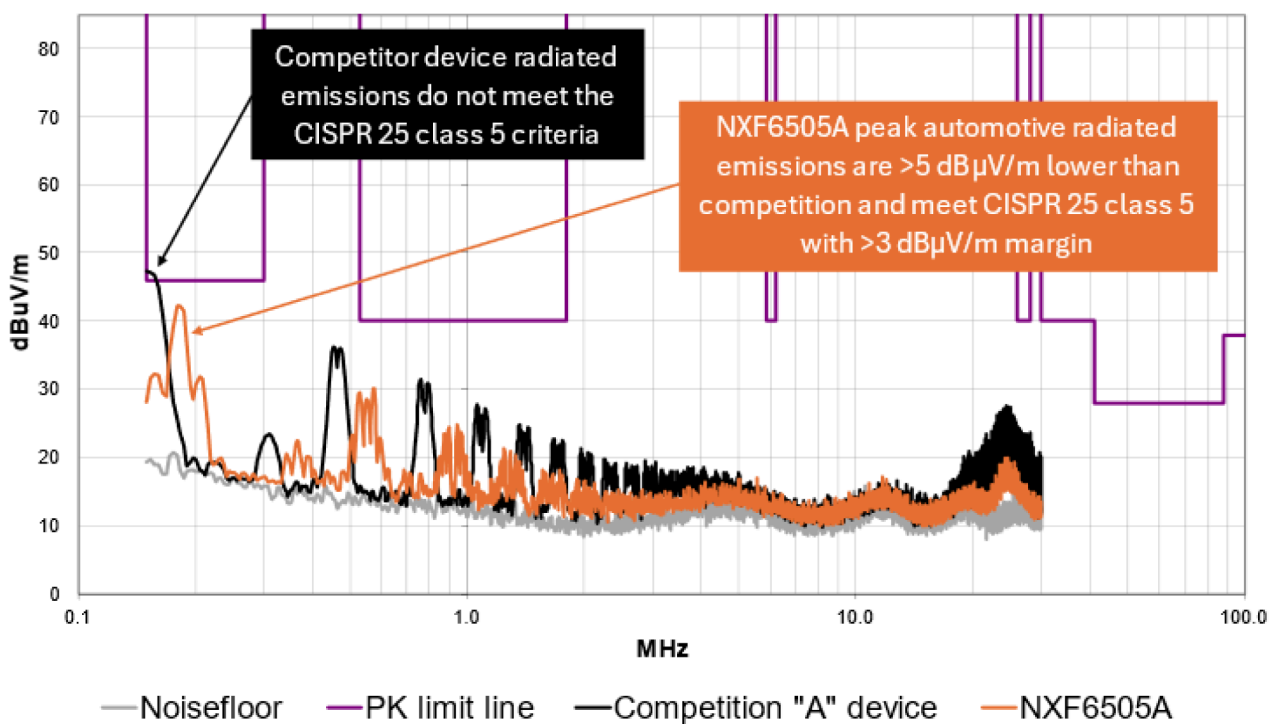


Reduce radiated emissions in isolated power designs using NXF650x-Q100



Abstract:

This document presents the low radiated emissions performance of Nexperia's newly developed isolated power supply driver family, NXF650x-Q100. This innovative design leverages advanced emission-reduction techniques and optimized switching strategies to minimize electromagnetic interference (EMI). Comprehensive testing under various operating conditions demonstrates that the driver consistently meets stringent international EMI standards, CISPR 25 and CISPR 32, ensuring reliable operation in sensitive electronic environments. The results highlight the driver's potential for applications requiring high efficiency and low noise, making it an ideal solution for automotive and industrial electronic systems.

Keywords:

EMC, CISPR32, CISPR25, NXF6501, NXF6505, push-pull, power isolation

1. Introduction

Nexperia's new push-pull isolation transformer driver devices, [NXF6501-Q100](#), [NXF6505A-Q100](#), and [NXF6505B-Q100](#), offer the lowest radiated emissions performance for isolated power supplies compared to similar existing devices in the market. The new devices have been engineered to deliver superior performance without the need for additional filtering components, meeting the industry's most stringent industrial and automotive standards, enabling system designers to achieve higher levels of performance by easily replacing existing solutions. The NXF650x product family proudly complies with both the automotive radiated emissions standard, CISPR 25, and the industrial radiated emissions standard, CISPR-32, demonstrating their versatility across various applications. This application note provides data and insights that show the exceptional capabilities of the new NXF650x product family and how they compare with existing solutions in the market.

Data for this report was collected in fully compliant EMC chambers, using the [NXF650x-Q100](#) evaluation boards operating at 5-V without any snubber or filter circuitry.

2. Automotive radiated emissions, CISPR 25

The vehicle emissions standard, CISPR 25, is the most recognized automotive EMC standard, and it offers five levels of compliance, with class 1 being the most lenient and class 5 being the strictest. Meeting CISPR 25 class 5 helps ensure a semiconductor device will facilitate system designs for automotive projects, since the end EMC requirements will be around these levels or even more stringent.

For lowest radiated emissions performance, [NXF6505A-Q100](#) is recommended from the NXF650x family since it offers the slowest switching frequency and slowest switching slew rate, which in turn minimizes radiated emissions due to high-frequency noise in the switching node. Data shown in [Fig. 1](#) compares NXF6505A-Q100 against a similar competitor device in the same test circuit at 500-mA load output conditions.

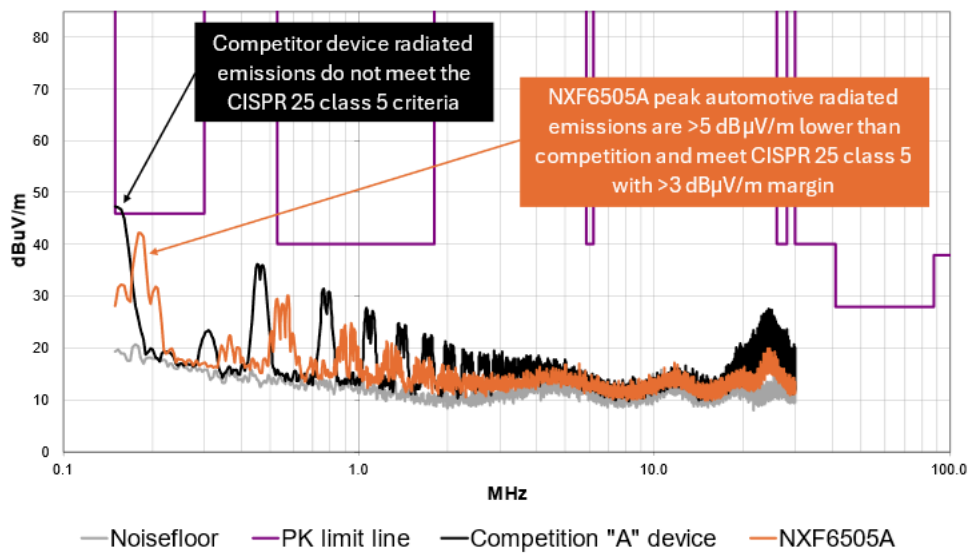


Fig. 1. NXF6505A CISPR 25 class 5 emissions vs. similar competition at 500-mA loads

NXF6505A shows margin to peak limit lines in the 150 kHz – 30 MHz band, meeting the CISPR 25 class 5 standard requirement, whereas the competition device exceeds the limit in this band.

As shown in [Fig. 1](#), NXF6505A-Q100 can meet CISPR 25 class 5 with margin compared to competition under the most common operating conditions. To demonstrate NXF6505A's lowest automotive radiated emissions performance, the four data plots in [Fig. 2](#) show passing measurements for the entire CISPR 25 class 5 radiated emissions range using TX1-ZB1445-CE transformer on the device EVB. [NXF6505A-Q100](#)'s superior emissions performance helps mitigate chances of system designers having to address system emissions compliance issues during the later stages of the design process.

Reduce radiated emissions in isolated power designs using NXF650x-Q100

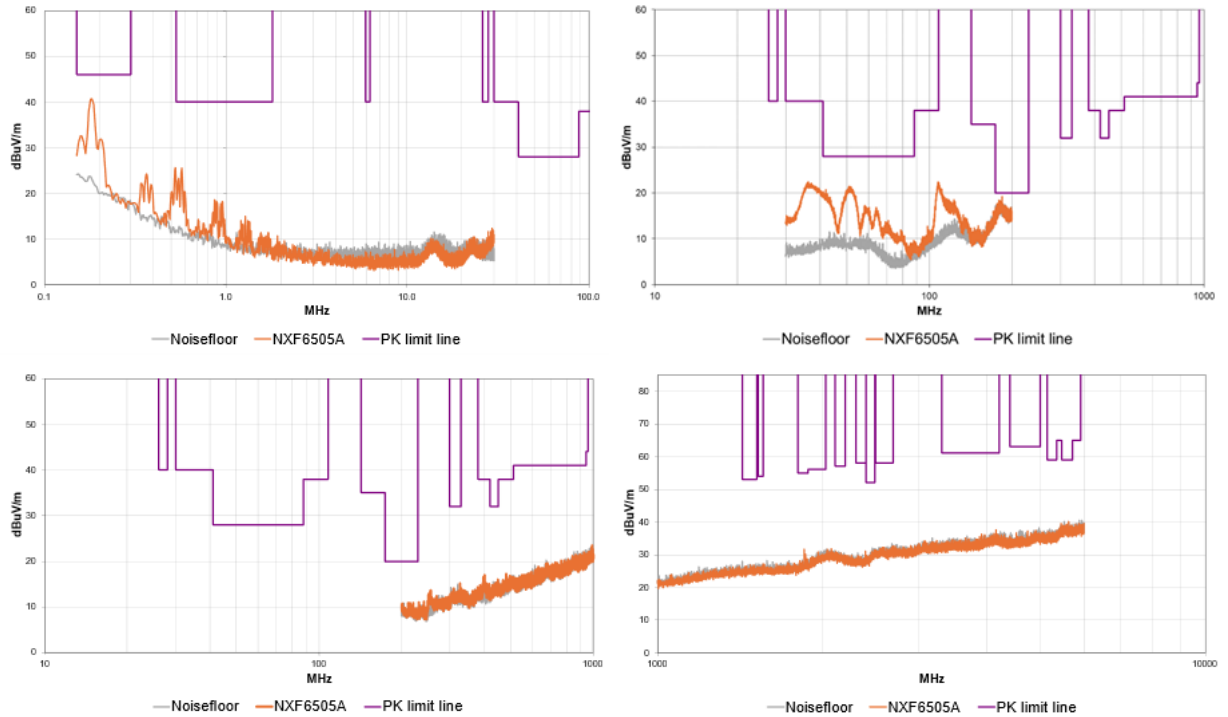


Fig. 2. NXF6505A meets CISPR 25 class 5 emissions requirements at 500-mA loads

3. Industrial radiated emissions, CISPR 32

The multimedia equipment emissions standard, CISPR 32, is the most commercially recognized industrial EMC standard, and it offers two levels of compliance, with class A being the most lenient and class B being the strictest. Meeting class CISPR 32 class B with as much margin as possible helps ensure a semiconductor device will facilitate system designs for industrial projects, since the end EMC requirements will be around these levels.

NXF6505A and NXF6505B can supply up to 6-W of output power and compared to the 5-W full-load conditions of similar competition devices, they can supply up to the same 1-A of output current with lower emissions per CISPR 32 class B. Fig. 3 illustrates a comparison of both NXF6505 devices and two competitor devices.

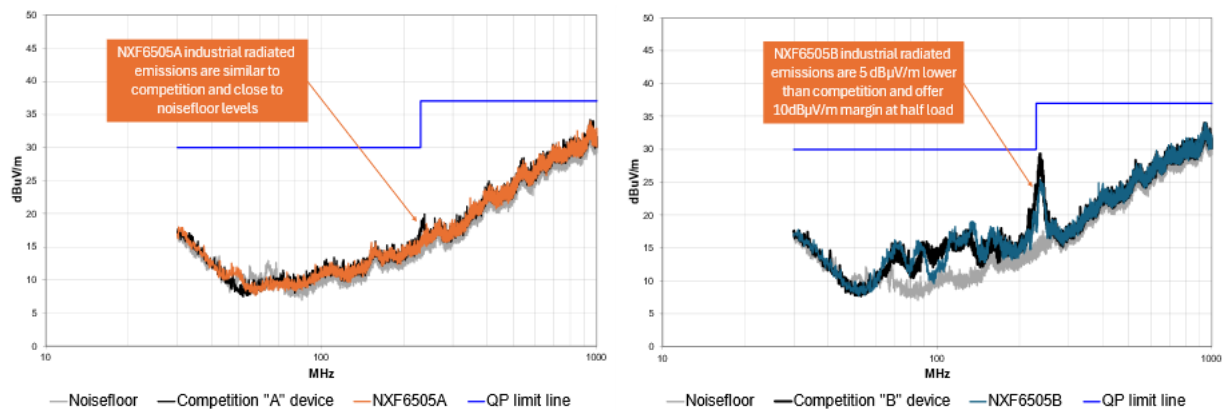


Fig. 3. NXF6505 devices have lower radiated emissions per CISPR 32 class B vs. similar competition at 500-mA loads

Reduce radiated emissions in isolated power designs using NXF650x-Q100

Both NXF6505 devices show margin to peak limit lines in the 30 MHz – 1 GHz band, meeting the CISPR 32 class B standard requirement with more margin than competition. Additionally, the entire NXF650x-Q100 family of devices meets CISPR 32 class B at full, 1-A output loads with greater than 6 dB μ V/m margin to the limit line, as shown in Fig. 4. NXF6505A-Q100 provides the most margin to the limits, operating near the emissions chamber noise floor. NXF6501-Q100 and NXF6505B-Q100 offer faster switching frequencies to help minimize the size of the push-pull transformer they drive, so designs using these parts can be smaller while meeting CISPR 32 class B. Added emissions margins provided by the entire NXF650x device family provide options for industrial system designers to reduce cost, increase performance, and minimize engineering time.

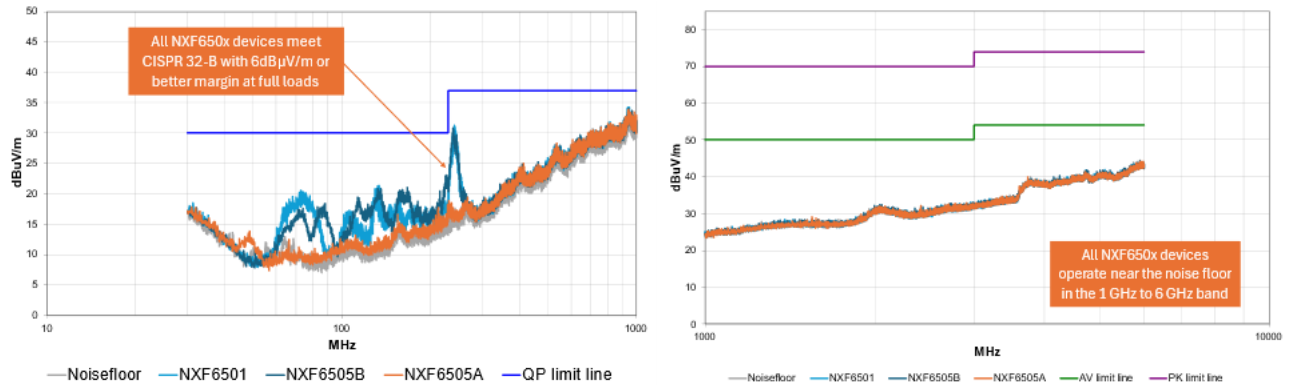


Fig. 4. All NXF650x devices meet CISPR 32 class B emissions with >6dB μ V/m margin at 1-A loads

4. Summary

Push-pull isolated power supplies offer compact, efficient, and flexible isolated power solutions. Nexperia's NXF650x family of push-pull transformer drivers add simplicity to the list of benefits by helping eliminate filtering and snubber components in EMC-sensitive designs while meeting the most stringent automotive and industrial requirements. The NXF650x device family helps system designers mitigate implementation risk, improve emissions performance, and reduce engineering effort with solutions that are drop-in compatible with industry standard footprints. To further reduce emissions or meet custom requirements, system-level changes to Nexperia's evaluation board schematic can be made and the operating power levels can be reduced. Please [contact Nexperia](#) for additional support and visit Nexperia's [transformer driver webpage](#) to request samples and view product datasheets.

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