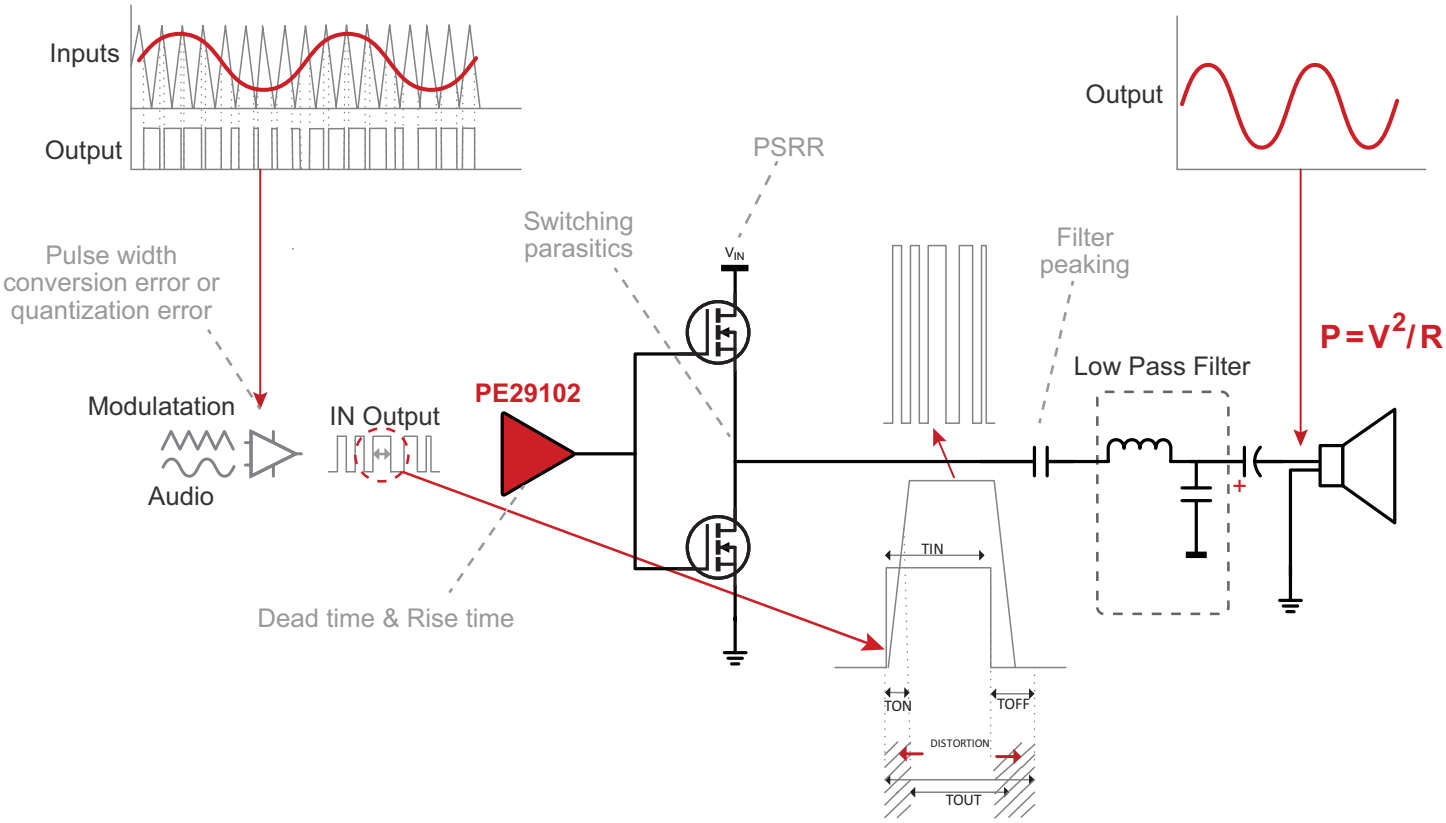
Distortion Reduction in Class D Audio Systems

One of the traditional problems with Class D amplifiers is their high transient intermodulation distortion (TIM). TIM results in part from the characteristics of silicon MOSFETs, whose switching anomalies (due to parasitics), high on-state resistance, and very high stored gate charge make lowering distortion difficult to achieve. Large amounts of feedback can be used in Class D amplifiers to compensate for this mediocre open-loop performance, but the feedback introduces TIM that degrades the output signal.

Causes of Distortion

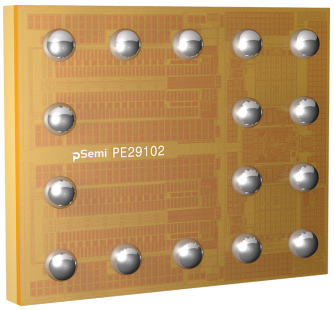


GaN: A Distortion Solution

The use of gallium nitride (GaN) FETs has a large advantage with respect to MOSFETs and facilitates a far better open-loop performance. Optimal audio quality is achieved by using a combination of the following: careful choice in the output low pass filter (especially the specification of the inductor), reduction of jitter and dead-time in the switching device, and carefully-applied minimal negative feedback.

GaN FETs switch more cleanly than MOSFETS due to lack of body diode parasitic minimizing jitter and distortion.

The jitter range for a GaN FET switched by the PE29102 is impressively narrow, with a low standard deviation figure.



PE29102 GaN FET Driver

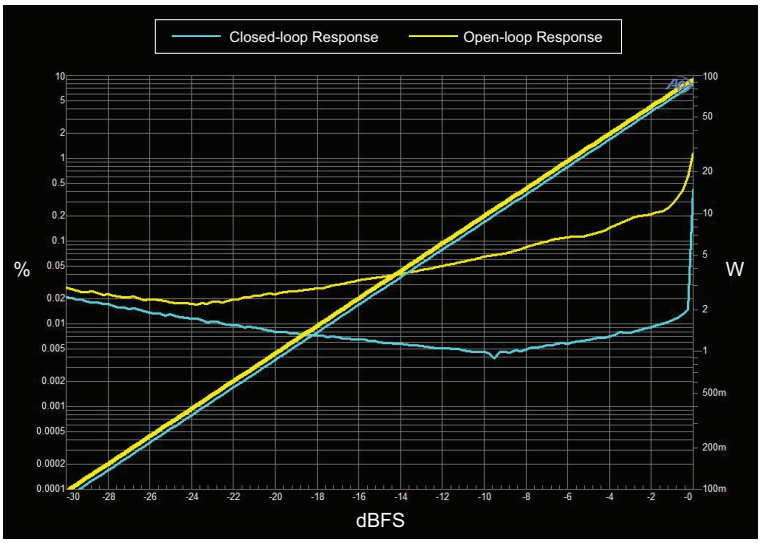
The PE29102 is an integrated high-speed driver designed to control the gates of external power devices, such as gallium nitride (GaN) FETs. The outputs of the PE29102 are capable of providing switching transition speeds in the sub-nanosecond range for switching applications up to 40 MHz. The PE29102 is optimized for matched dead time and offers best-in-class propagation delay to improve system bandwidth.

Full Class D Audio System

pSemi has developed a test platform to demonstrate the open- and closed-loop performance potential of a full Class D audio system using the PE29102 and EPC2016C.

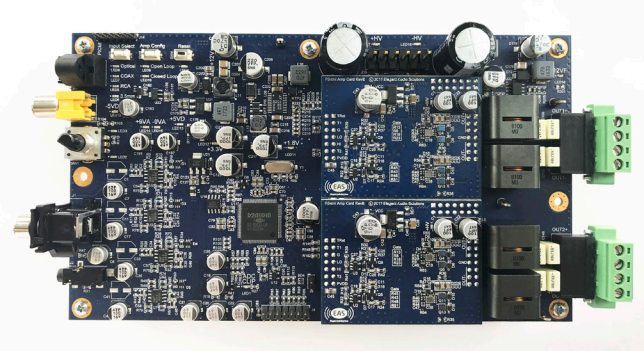
PE29102 and EPC2016C Open- and Closed-loop Response

pSemi Amp Daughter Card Evaluation



Switching frequency 404 kHz, +/-20V power supplies, 8 Ohms, open loop, timing = 0s: THD vs Level @ 1 KHz - SPDIF input

Initial results of the test platform highlight the excellent closed- and open-loop response of the PE29102 and EPC2016C combination and provide baseline performance data for future designs.



Test platform units are available for demonstration purposes.

Application Note Available

AN72: Class D Audio Using the PE29102

Overview: This application note provides pSemi customers with a general overview of Class D Audio techniques and shows how one or two PE29102 GaN FET driver(s) may be used to each drive a pair of GaN FET devices for such an application.

Contact for Additional Materials: sales@psemi.com

Application Note and EAS test platform schematics and layouts are available upon request.

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