DI-203 Design Idea
PeakSwitch®

50 W Continuous (200 W Peak) Audio Power Supply

Application	Device	Power Output	Input Voltage	Output Voltage	Topology
Audio Amplifier	PKS607YN	50 W cont, 200 W pk	90 – 265 VAC	±28 V, 12 V	Flyback

Design Highlights
- Replaces line-transformer based power supplies in home audio applications
- Compact and lightweight
- Fast transient response and high loop bandwidth allows for excellent results with Class-D amplifiers
- High peak power matches crest factor requiements of audio signals
  - Saves cost by eliminating overdesign
- Shutdown inhibit circuit allows output to droop during extreme overloads, preventing audible drop outs
- Dual convertor design maintains excellent cross regulation between high voltage rails
- Auxiliary output eliminates separate house-keeping power supply
- High Efficiency
  - Efficiency greater than 75% at full load

Operation
The universal input power supply shown in Figure 3 has two main output voltages, +28 V and -28 V, and consists of two parallel converters. Each output can deliver 25 W continuous, 100 W peak. Each converter uses a PeakSwitch (PKS607YN) which share a common input stage. The 12 V output is rated to provide an output current of 333 mA. Duration of peak power output is thermally limited, being determined by environment and heat-sinking.

Common mode chokes, L1 and L2 along with Y-capacitors C3, C4, C23 and C24 form the common mode EMI filter. Inductors L3, L4 and L5 and capacitors C5, C10 and C2 provide differential mode EMI filtering.

During start-up, switching is inhibited until the input voltage is above the undervoltage threshold, which is determined when a current of >25 μA flows into the EN/UV Pin, set by R5, R11 and R10, R15.

The controller in U3 (U2) skips switching cycles to regulate the output voltage based on feedback to the EN/UV pin. When the current pulled from the pin exceeds 240 μA, a low logic level (disable) is generated. At the beginning of each cycle, the EN/UV pin state is sampled, and if high, the power MOSFET inside U3 (U2) is turned on for that cycle (enabled). Audio applications demand that the power supply output voltage droops during an overload condition, rather than shutting down completely. The shutdown inhibit circuit, driven by 555 timer U1, pulls current from the EN/UV pin every 30 ms to ensure the controller never enters output auto-restart mode, instead relying on the internal thermal shutdown to provide overload protection.

Two independent feedback loops are used to control the voltages on the ±28 V outputs. This ensures that both outputs are tightly regulated and also ensures excellent cross-regulation between outputs.

Key Design Points
- High crest factor of the audio loads allowed smaller heatsinks.
- Drain to source snubbers (C14, R13 and C19, R18) were used to reduce EMI.

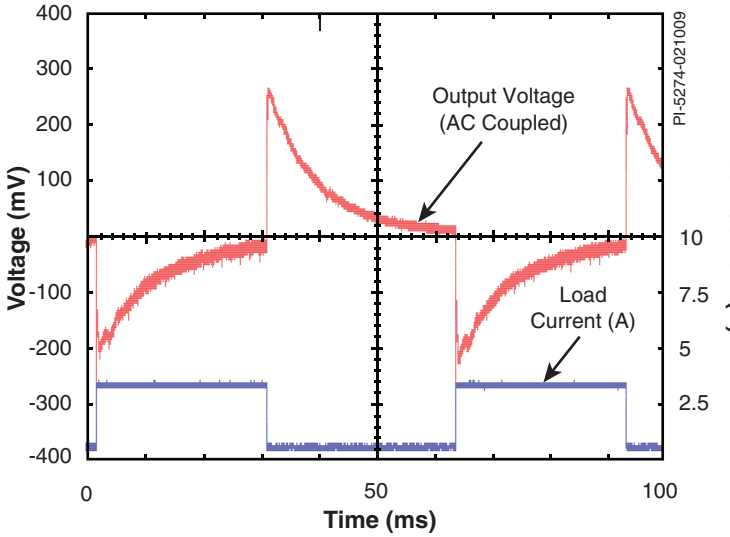

Figure 1. Load Step Response (0.9 A - 3.6 A - 0.9 A) on +28 V Output at 115 VAC.

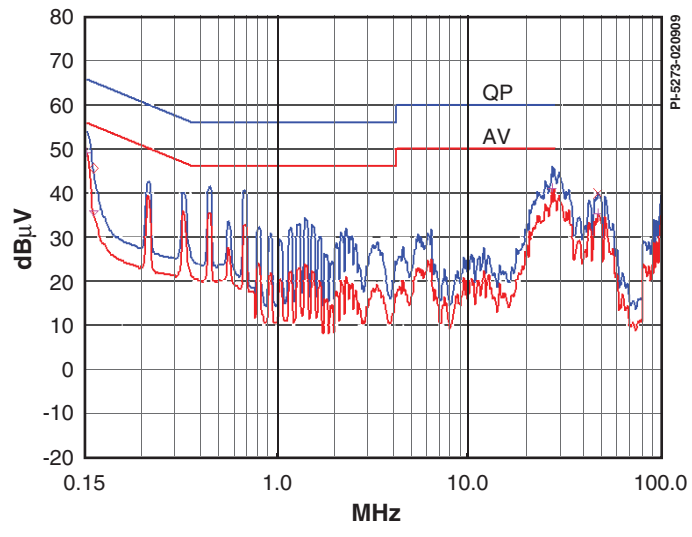

Figure 2. Conducted EMI of 230 VAC With Output Grounded (CISPR-22/EN55022B Limit Lines Shown).

- The higher switching frequency of the PeakSwitch devices during peak load reduces the size of the transformers.
- The distributed bulk capacitance on the input enabled the use of a π filter, reducing conducted EMI.
- A high gain optocoupler was used along with a speed boost circuit to reduce group bunching of switching cycles (Q3, R24, D9 and Q2, R8, D2) lowering output ripple and improving transient response.

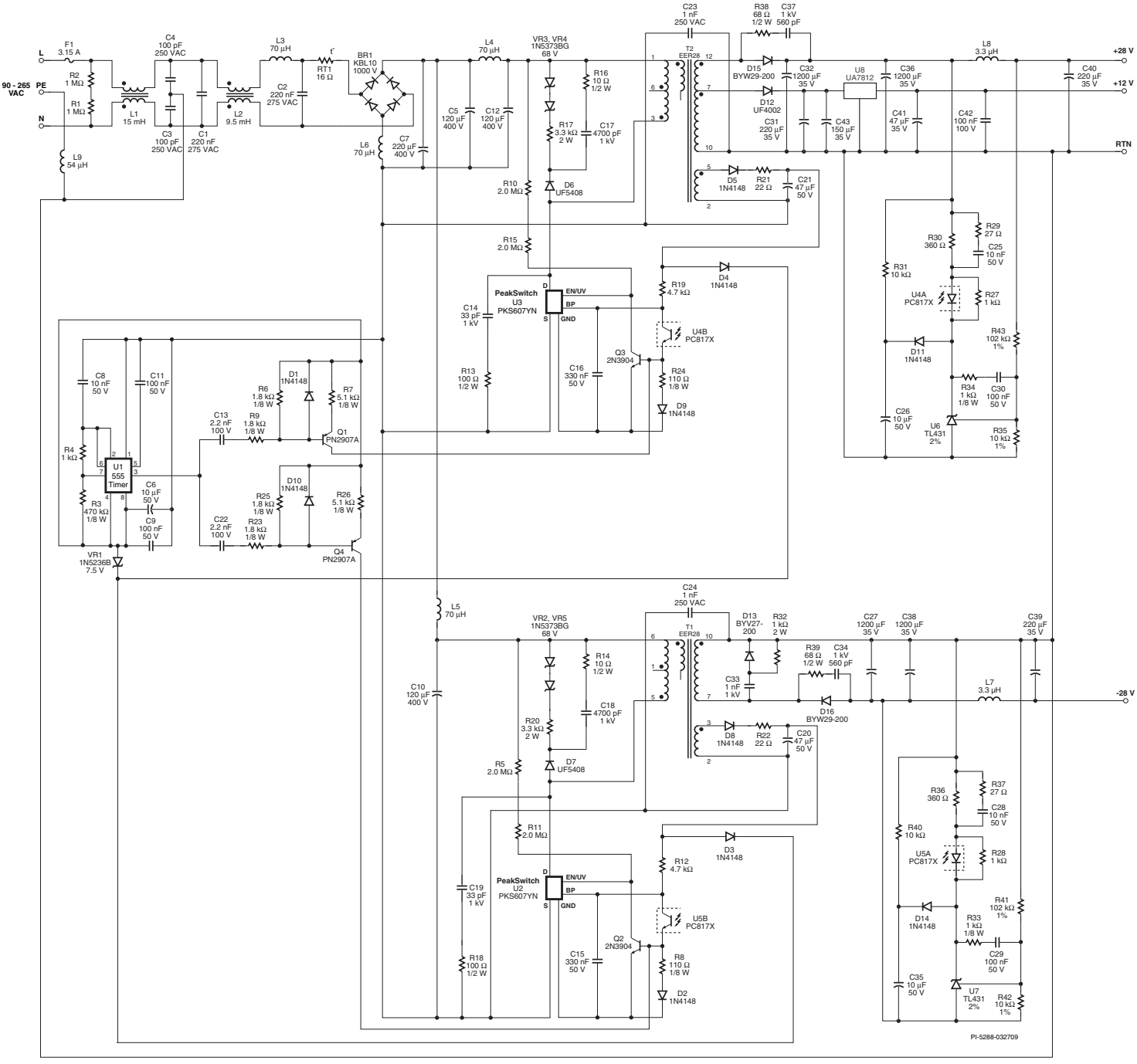

Figure 3. 50 W Continuous, 200 W Peak Audio Amplifier Power Supply Using PKS607YN.

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