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APPLICATION NOTE 1001

Off-The-Shelf Transformer Adapts Controller For SLIC Applications

We recommend the MAX1856 for new SLIC power supply designs.

A new multiwinding transformer (configurable by the user for a variety of applications) enables an inverting controller to produce the high negative voltages required by an ISDN board or other telephone-line card (**Figure 1**).

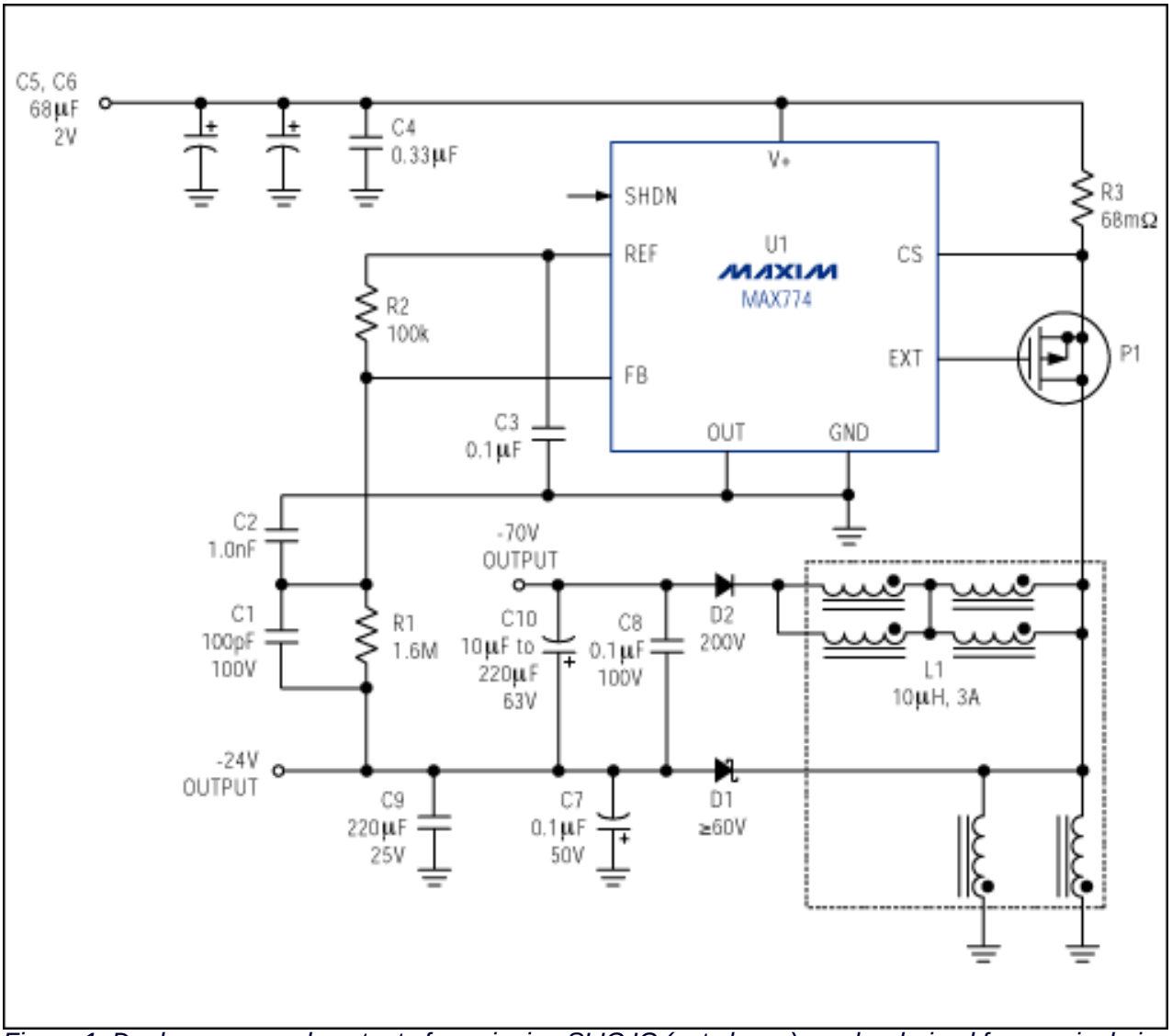

Figure 1. Dual power-supply outputs for a ringing SLIC IC (not shown) can be derived from a single inverting controller (IC1) by connecting several windings in an autotransformer configuration.

Such line cards employ a subscriber-line interface circuit (SLIC) such as the 79R79 ringing SLIC from AMD. This IC generates the off-hook and on-hook signal transmission, ring-tone generation, and ring-tip detection that constitute an

analog telephone interface. For off-hook signal transmission, it requires a tightly regulated -24V or -48V; for generating ring tones, it requires a loosely regulated -70V. The five-ringer-equivalent requirement demands 9W to 10W from the -70V output, which translates to a full-load IOUT of about 150mA.

C1 is an inverting switching regulator that normally converts a 3V to 16V input to a fixed output of -5V or an adjustable output. In the circuit shown, three pairs of windings in series (provided by a single, off-the-shelf, multiwinding transformer) enable IC1 to generate the high voltages needed by a SLIC IC.

Connecting a diode and output capacitor (D1 and C7/C9) at the first or second pair of windings produces -24V (as shown) or -48V, respectively. Feedback to the IC via R1 and R2 achieves tight regulation at this output. The transformer turns ratios establish a loose regulation at the -70V output.

The circuit shown can service a five-telephone load (10W) from an input of 12V ±10%. It operates down to 3V, and produces about 2.4W at 3.3V and 3.9W at 5V. The -70V output depends on cross regulation with respect to the -24V output, and is therefore affected by relative loading on the two outputs (i.e., whether one is heavily loaded and the other lightly loaded, or vice-versa).

Multifilar transformer windings improve cross regulation by increasing the voltage coupling between outputs and by reducing the voltage spiking caused by leakage inductance. Cross regulation is also improved by connecting the -70V output's filter capacitor (C8/C10) to the -24V output instead of to ground. This connection also simplifies board layout and enhances stability.

The circuit shown in Figure 1 is optimized for compact surface-mount applications, and produces a worst-case ripple voltage at the -24V output of approximately 200mVp-p. To reduce this ripple, increase the capacitor values and use through-hole filter capacitors with low equivalent series resistance, such as the Sanyo MV-GX series. To prevent interference, place the dc-dc converter on a corner of the board opposite the sensitive audio circuitry. Cross-regulation graphs (as a guide to the preloading performance) and a tested pc board layout are available on request from Maxim's applications department.

A similar idea appeared in the 11/4/96 issue of Electronic Design.

More Information

MAX774: QuickView -- Full (PDF) Data Sheet -- Free Samples