Keywords: subscriber line interface card, SLIC, boost controller, transformer flyback typology, optocoupler, shunt voltage regulator, linear voltage regulator

APPLICATION NOTE 1115

Isolated SLIC supply

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Abstract: This application note shows a power supply that generates three isolated voltages for SLICs. The isolated power supply uses a boost controller, the MAX668, with a transformer in flyback typology for -24V, and -72V outputs, and isolates the feedback signal with an optocoupler. A linear voltage regulator, the MAX8867, provides the 3.3V output.

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Some subscriber line interface cards (SLICs) require power-supply voltages isolated from the local supply. The **Figure 1** circuit generates three such isolated voltages from a 5V input: +3.3V at 100mA, -24V at 100mA, and -72V at 25mA. It features a boost controller (U1) operating in a transformer flyback topology, and an optocoupler for isolating the feedback signal. To provide this feedback (from the -24V output to the boost controller) the optocoupler (U4) is driven by a shunt voltage regulator (U3) acting as an error amplifier.

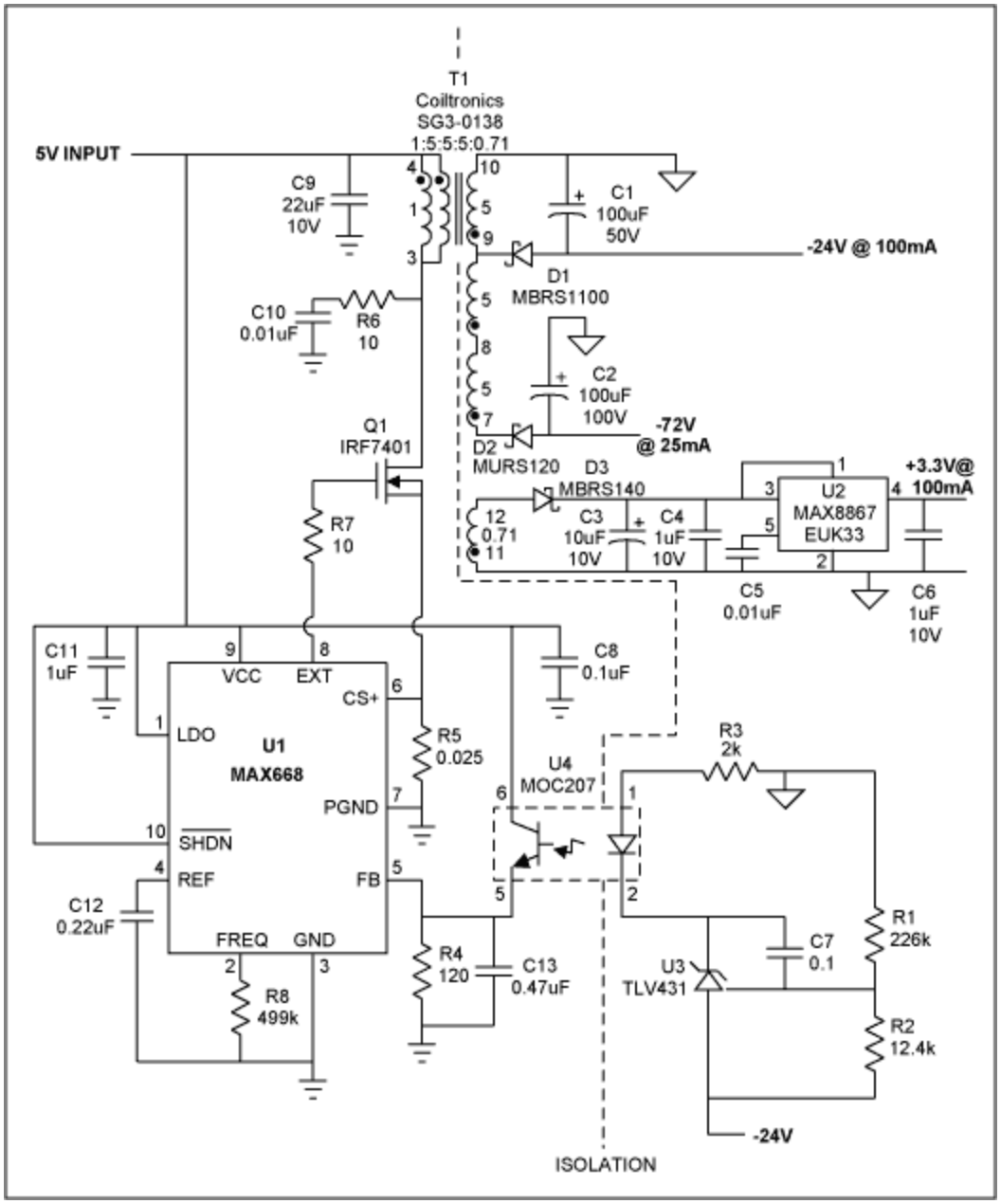

Figure 1. This SLIC power supply isolates the three outputs (+3.3V, -24V, and -72V) with a transformer, and isolates the feedback signal with an optocoupler.

The wide range of output voltages requires a custom transformer. Its core is a standard-geometry Coiltronics SG3-0138 with A_L = 138nH/T². The primary inductance is 6.8µH, and the peak primary current is 4A. The primary-to-secondary turns ratio is 1:5, so for best efficiency the converter operates with a duty cycle near 50%. The unregulated -72V output is derived from the regulated -24V output via three identical secondary windings connected in series. Also available is a tap for a -48V output, and a low-voltage winding that drives a linear voltage regulator (U2) to provide the +3.3V output. The transformer's winding specs are:

Primary: 7T 28AWG bifilar

Secondary:	35T	32AWG
	35T	32AWG
	35T	32AWG
	5T	32AWG

At maximum specified load with an input of 5.0V at 1.138A, the circuit yields 80% efficiency while delivering +3.28V at 103.9mA, -24.0V at 100mA, and -73.2V at 25.2mA.

V_{IN} (V)	I_{in} (A)	V_O (V)	I_O (mA)	V_O (V)	I_O (mA)	V_O (V)	I_O (mA)	Eff. (%)
4.50	1.27	24.01	100.2	73.2	25.2	3.28	103.9	80.3
5.01	1.138	24.01	100.2	73.2	25.2	3.28	103.9	80.5
5.50	1.038	24.01	100.2	73.2	25.2	3.28	103.9	80.4

Notes:

1. T1 is wound on a standard geometry core with 138nH/T².
   Primary inductance is 6.7µH.
   Primary is 7 turns of #28 bifilar.
   Tapped secondary is three layers of 35 turns each of #32 per tap.
   Low voltage secondary is 5 turns of #32.

Related Parts		
MAX668	1.8V to 28V Input, PWM Step-Up Controllers in µMAX	Free Samples
MAX8867	Low-Noise, Low-Dropout, 150mA Linear Regulators in SOT23	Free Samples

More Information
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