APPLICATION NOTE 1115

Isolated SLIC supply

Jun 14, 2002

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.

A similar version of this article appeared in the September 24, 2001 issue of EE Times magazine.

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 $A_L = 138nH/T^2$. 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.

<table>
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<tr>
<th>V_IN (V)</th>
<th>I_IN (A)</th>
<th>V_O (V)</th>
<th>I_O (mA)</th>
<th>V_O (V)</th>
<th>I_O (mA)</th>
<th>Eff. (%)</th>
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<tbody>
<tr>
<td>4.50</td>
<td>1.27</td>
<td>24.01</td>
<td>100.2</td>
<td>73.2</td>
<td>25.2</td>
<td>103.9</td>
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<td>1.138</td>
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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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Availability</th>
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<tbody>
<tr>
<td>MAX668</td>
<td>1.8V to 28V Input, PWM Step-Up Controllers in µMAX</td>
<td>Free Samples</td>
</tr>
<tr>
<td>MAX8867</td>
<td>Low-Noise, Low-Dropout, 150mA Linear Regulators in SOT23</td>
<td>Free Samples</td>
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More Information

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