Application

This power supply was originally developed for aerospace applications but has found use in many other projects because of its flexibility and simplicity. The ability to generate positive and negative voltages is convenient for systems using analog circuits based on operational amplifiers and comparators. The two high-current regulators are useful for power such subsystems as RF power amplifiers, DSPs and FPGAs.

Configurations

The input voltage may typically vary from 26-32V (range of voltage from spacecraft battery system). Output voltages may be set to anywhere from 3.3 to 12V. The input power supply feeds a balanced, unregulated push-pull DC-DC converter that is isolated from the secondary-side ground potential. Note that AC ground potential is maintained using capacitive coupling. The level of AC coupling can be adjusted by changing the value of coupling capacitance. On the secondary side, regulated buck converters provide the various output voltages. Each of these voltages is programmed by a pair of feedback resistors in the regulator circuit. The level of current limiting is also programmed by means of a series resistor.

Brief system description

The power supply is a cascaded system with an unregulated, isolated DC-DC converter followed by a set of regulated buck converters. There is also provision for using a linear regulator for low-noise applications. The unregulated DC-DC converter uses a compact quadrifilar-wound ferrite transformer operating at 200 kHz for efficient energy conversion with a minimum of leakage-inductance effects. Separated (non-quadrifilar) winding transformers can also be used for extra isolation at the expense of a slight degradation in conversion efficiency.

KEY FEATURES

- Transformer coupling provides galvanic isolation from input power source
- Current limiting provides short-circuit protection
- Soft starting reduces inrush current
- Five regulated output voltages: four positive and one negative
- Two high current (2 amp) positive outputs
- Regulator voltage set by resistor pair
- Input voltage may vary over wide range while still maintaining output regulation
- Full load efficiency typically 85%
- No optocouplers used in feedback loops, for improved resistance to radiation
## Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC input voltage</td>
<td>26-32V</td>
<td></td>
</tr>
<tr>
<td>DC voltages out</td>
<td>-5, 3.3, 5, 7, 12V</td>
<td>Typical combination</td>
</tr>
<tr>
<td>High current DC outputs</td>
<td>2A max</td>
<td>Dependent on inductor sizing/output voltage</td>
</tr>
<tr>
<td>Low current DC outputs</td>
<td>0.5A max</td>
<td>Dependent on inductor sizing/output voltage</td>
</tr>
<tr>
<td>Regulation</td>
<td>&lt;5%</td>
<td></td>
</tr>
<tr>
<td>DC-DC converter switch freq</td>
<td>200kHz</td>
<td></td>
</tr>
</tbody>
</table>

## Optional Modifications:

- Other output voltage combinations
- Addition of linear regulators for low-noise operation
- Higher-current operation
- Additional safety features (overvoltage/undervoltage shutdown, thermal protection, etc.)
- Non-isolated operation (for higher efficiency)

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