

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 467

150W ISOLATED POWER SUPPLY

LT3781 and LTC1698

DESCRIPTION

Demonstration circuit 467 is a 150W 5V output isolated DC/DC power supply with 36V to 72V input range. The switching frequency of the circuit is about 230kHz. 1500V input to output isolation is provided. Features of this demo board include primary side on/off control, $\pm 5\%$ secondary side trimming on the output, input over

voltage protection, under voltage lockout, output over voltage protection, and board over temperature shutdown. The complete design is mounted within a standard half brick PCB area with about half inch height.

Design files for this circuit board are available. Call the LTC factory.

Table 1. Performance Summary ($T_A = 25^\circ\text{C}$)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		36V
Maximum Input Voltage		72V
Output Voltage V_{OUT}	$V_{IN} = 36\text{V to } 72\text{V}, I_{OUT} = 0\text{A to } 30\text{A}$	5V $\pm 2\%$
Maximum Output Current		30A
Typical Output Ripple V_{OUT}	$V_{IN} = 48\text{V}, I_{OUT} = 30\text{A}$ (20MHz BW)	130mV _{P-P}
Output Regulation	Line	$\pm 0.1\%$
	Load	$\pm 0.2\%$
Nominal Switching Frequency		230kHz
Efficiency	$V_{IN} = 48\text{V}, I_{OUT} = 30\text{A}$	90.5% Typical
Output Voltage V_{OUT} TRIM	$V_{OUT\ TRIM} = 3.3\text{V}$	5% Typical
	$V_{OUT\ TRIM} = 0\text{V}$	-5% Typical
On/Off Control	Logic Low Voltage-Off	0.6V MAX
	Logic High Voltage-On	1V MIN
Isolation Voltage	Basic Insulation	1500VDC

OPERATING PRINCIPLES

Demonstration circuit 467 features the LT3781 and LTC1698 controllers. The basic power stage topology is a two-switch forward converter with synchronous rectification. The primary side controller uses an LT3781, a current mode two-switch forward controller with built-in MOSFET driv-

ers. On the secondary side, an LTC1698 is used to provide the voltage feedback for the 5V output, as well as the gate drive for the synchronous MOSFETs in the 5V output stage. The error amplifier output of LTC1698 is fed into the optocoupler and then relayed to LT3781 on the

primary side to complete the regulation of the 5V output.

A planar transformer PA0285 built by Pulse Engineering is employed as the power transformer in this design. This transformer is constructed on a PQ20 core with five turns of primary windings, two turns of secondary windings and five turns of auxiliary windings for the LT3781 bias supply. The primary side switches are Vishay

100V Si7456DP and the secondary synchronous switches are 40V Si7884DP. The demo board can deliver the full rated current (5V/30A) at room temperature without airflow. The hottest spot on the demo board (T1 transformer) has a temperature rise of 75°C at 48V input and full load (without airflow). In elevated temperature environments, airflow is required at heavy load.

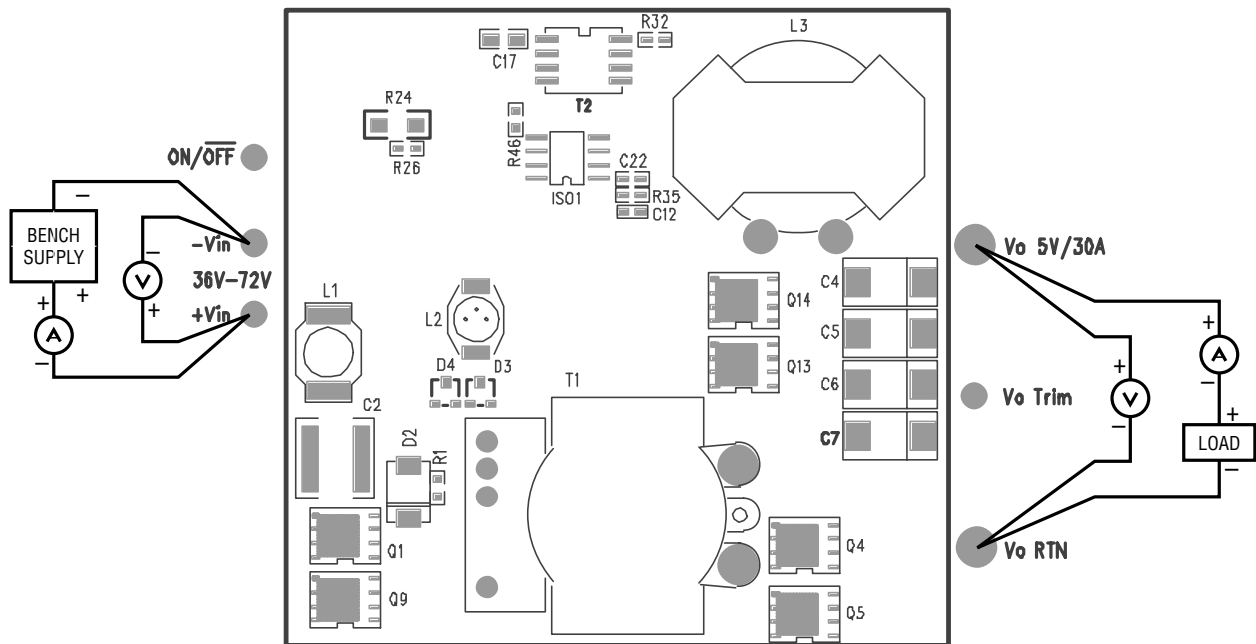
QUICK START PROCEDURE

Demonstration circuit 467 is easy to set up to evaluate the performance of the LT3781 and LTC1698. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the Vin or Vout and GND terminals. See Figure 2 for proper scope probe technique.

1. With the power off, connect the input power supply to +Vin (36V-72V) and -Vin (input return).
2. The on/off control pin should be left open for normal operation. (Connecting the on/off pin to -Vin turns off the converter.)
3. For normal 5V output, Vo Trim pin should be left open.
4. Connect the output load between Vo and Vo RTN.
5. Connect the DVMS to the input and output.
6. Turn on the input power supply and check for the proper output voltage. Vo should be 5V \pm 2%.

LT3781EG/LTC1698EGN 5V@30A ISOLATED POWER SUPPLY DEMO CIRCUIT 467A



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Figure 1. Proper Measurement Equipment Setup

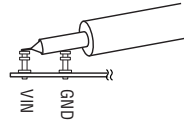


Figure 2. Measuring Input or Output Ripple

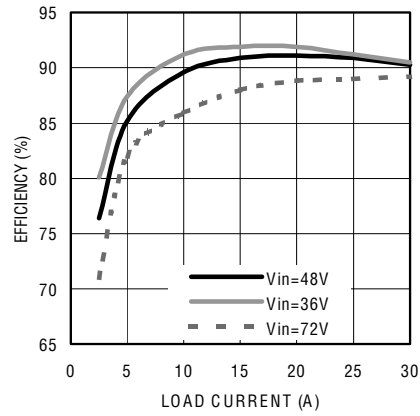


Figure 3. Efficiency vs load current: $V_o = 5V$