DEMO CIRCUIT 607
QUICK START GUIDE

LTC3722, LTC4440, LTC3901, and LT1431
Isolated Full Bridge Converter

DESCRIPTION

Demonstration circuit 607 is an Isolated Full Bridge Converter featuring the LTC3722, LTC4440, LTC3901, and LT1431. This circuit was designed to demonstrate the phase-shifted full bridge power supply to generate 12V at 35A from a typical telecom input voltage range of 36 to 72V. Isolation voltage is 1500VDC. Fixed zero-voltage transition timing was chosen because of the relatively fast bridge leg transition times with 48V input. The DC607A PCB layout includes options to implement adaptive timing.

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

Performance Summary (Typical, T_A = 25°C)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		36V
Maximum Input Voltage		72V
Output Voltage V_{OUT}	V_{IN} = 36V to 72V, I_{OUT} = 0A to 35A, 200LFM	12V
Maximum Output Current	200LFM	35A
Typical Output Ripple V_{OUT}	V_{IN} = 48V, I_{OUT} = 35A (20MHz BW)	200mV_{P-P}
Dynamic Response	Peak Deviation Load Step of 0A to 35A (1A/us) Settling Time (to within 30mV of set point)	300mV 750us
Nominal Switching Frequency		205kHz
Efficiency	V_{IN} = 48V, I_{OUT} = 35A, 200LFM V_{IN} = 48V, I_{OUT} = 25A, 200LFM	>92% Typical >93% Typical

OPERATING PRINCIPLES

The LTC3722 Synchronous Dual Mode Phase Modulated Full Bridge Controller is used on the primary and works together with the LTC3901 Secondary Side Synchronous Driver to provide a synchronous rectified output. When an input voltage is applied, the LTC3722 begins a controlled soft-start of the output voltage. As this voltage begins to rise, the LT1431 Programmable Reference is quickly powered up via the output voltage. The LT1431 provides feedback via optocoupler ISO1 to set the output voltage at 12V. The LTC4440 High Voltage Gate Driver is used to level shift the high side primary MOSFETs gate signals. The LTC3722 provides precise control of gate signals to primary MOSFETs and secondary MOSFETs via T3 and U1 (LTC3901). The LTC3901 includes a timer and current sense to limit reverse inductor current.

For large values of input inductance, a 100V, 47uF electrolytic capacitor can be added across the input terminals to damp the input filter and provide adequate stability. See Linear Technology Application Note AN19 for a discussion on input filter stability analysis. A recommended part is the Sanyo 100MV47AX.

QUICK START PROCEDURE

Demonstration circuit 607 is easy to set up to evaluate the performance of the LTC3722, LTC4440, LTC3901, and LT1431. 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 output (or input) voltage ripple by touching the probe tip and probe ground directly across the +Vout and –Vout (or +Vin and –Vin) terminals or input/output capacitors. See Figure 2 for proper scope probe technique.

1. Set an input power supply that is capable of 36V to 72V to a voltage of 36V. Then turn off the supply.
2. With power off, connect the supply to the input terminals +Vin and –Vin.
   a. Input voltages lower than 36V can keep the converter from turning on due to the undervoltage lockout feature of the LTC3722.
   b. If efficiency measurements are desired, an ammeter capable of measuring 15Adc or a resistor shunt can be put in series with the input supply in order to measure the DC607A's input current.
   c. A voltmeter with a capability of measuring at least 72V can be placed across the input terminals in order to get an accurate input voltage measurement.
3. Turn on the power at the input.

   NOTE. Make sure that the input voltage never exceeds 72V.
4. Check for the proper output voltage of 12V ± 1%. Turn off the power at the input.
5. Once the proper output voltage is established, connect a variable load capable of sinking 35A at 12V to the output terminals +Vout and –Vout. Set the current for 0A.
   a. If efficiency measurements are desired, an ammeter or a resistor shunt that is capable of handling 35Adc can be put in series with the output load in order to measure the DC607A's output current.
   b. A voltmeter with a capability of measuring at least 12V can be placed across the output terminals in order to get an accurate output voltage measurement.
6. Turn on the power at the input.

   NOTE. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
7. Once the proper output voltage is again established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other desired parameters.

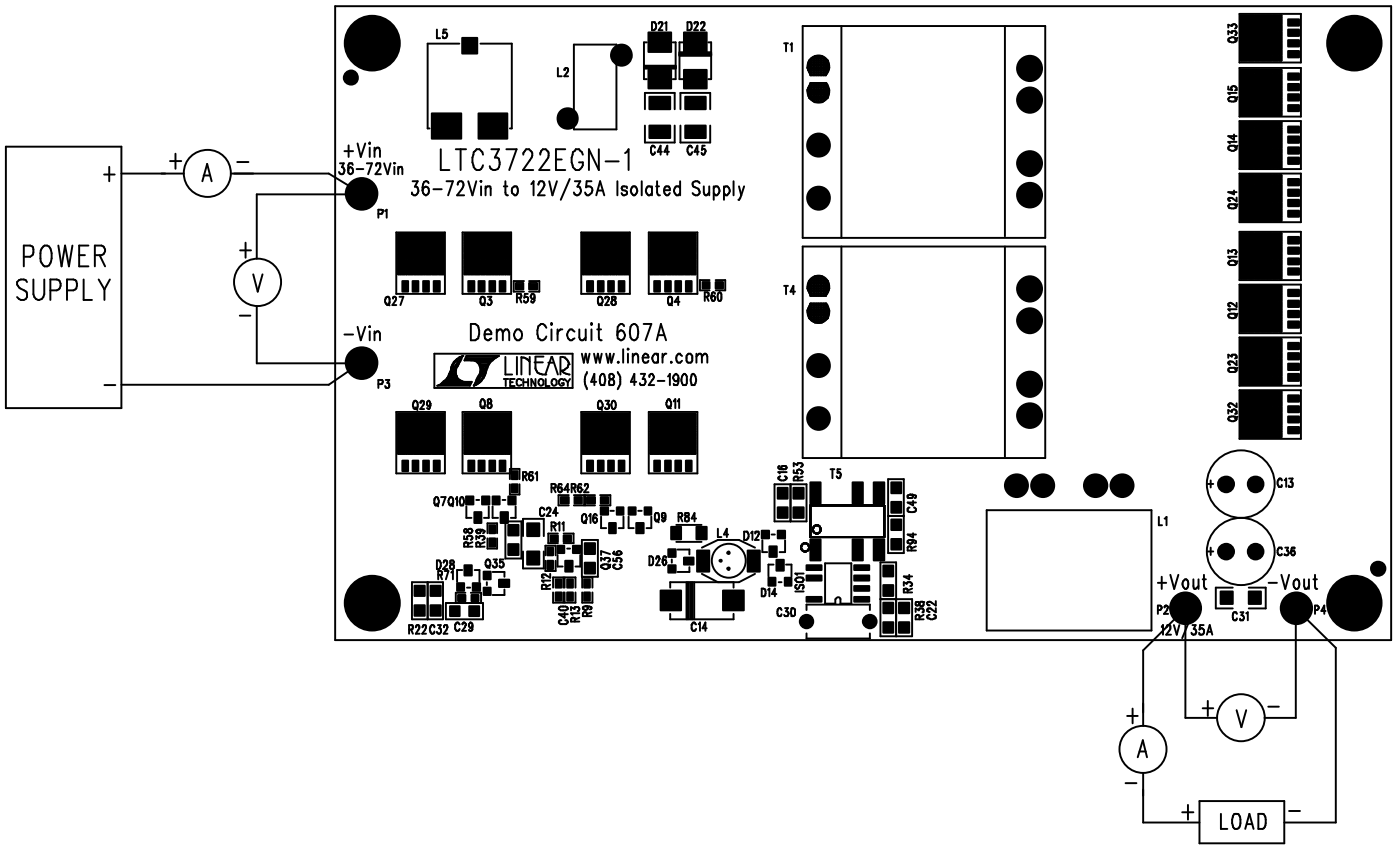

Figure 1. Proper Measurement Equipment Setup

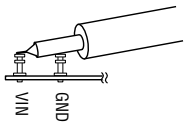

Figure 2. Measuring Input or Output Ripple

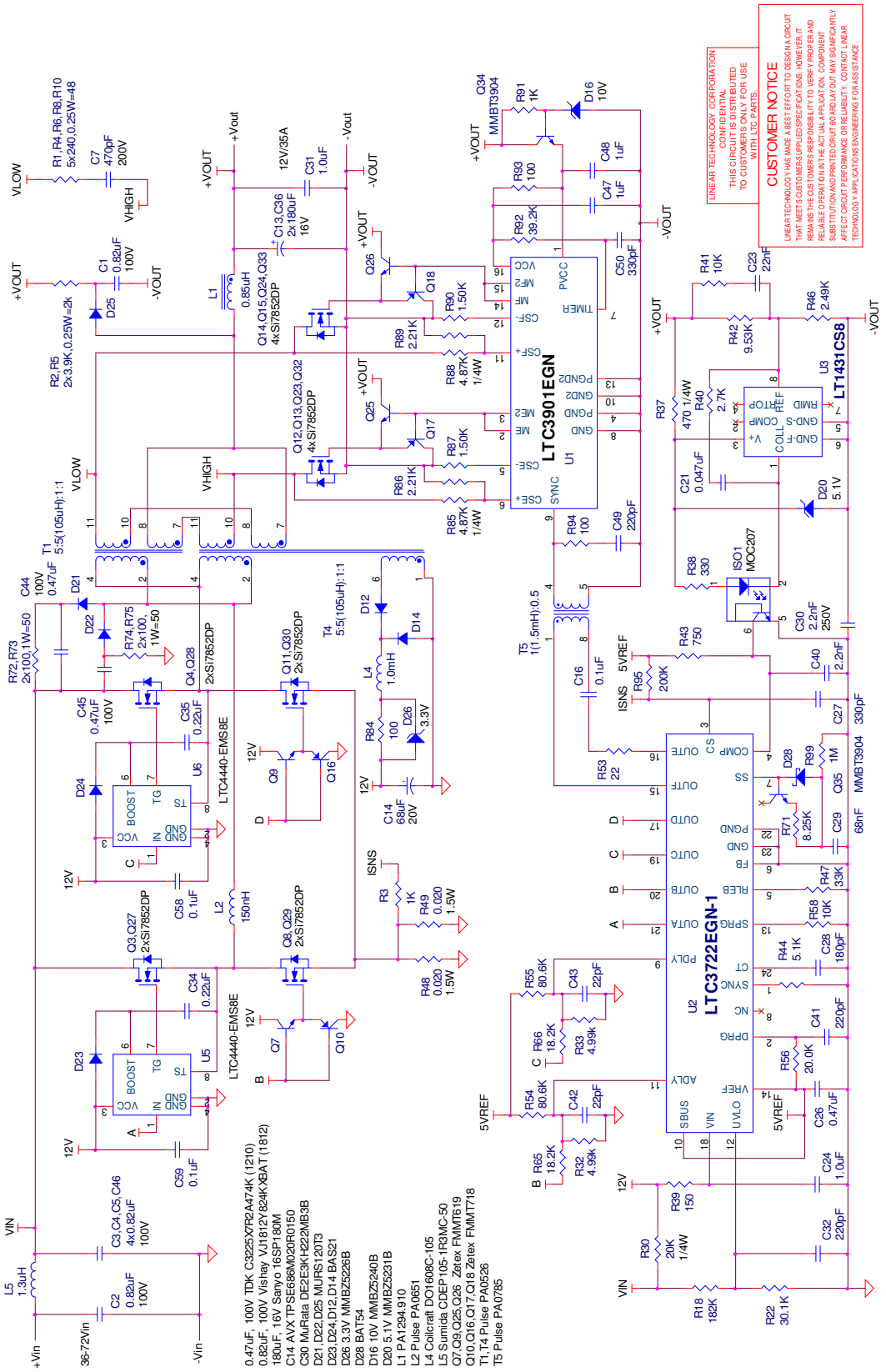

Figure 3. Schematic without Optional Components

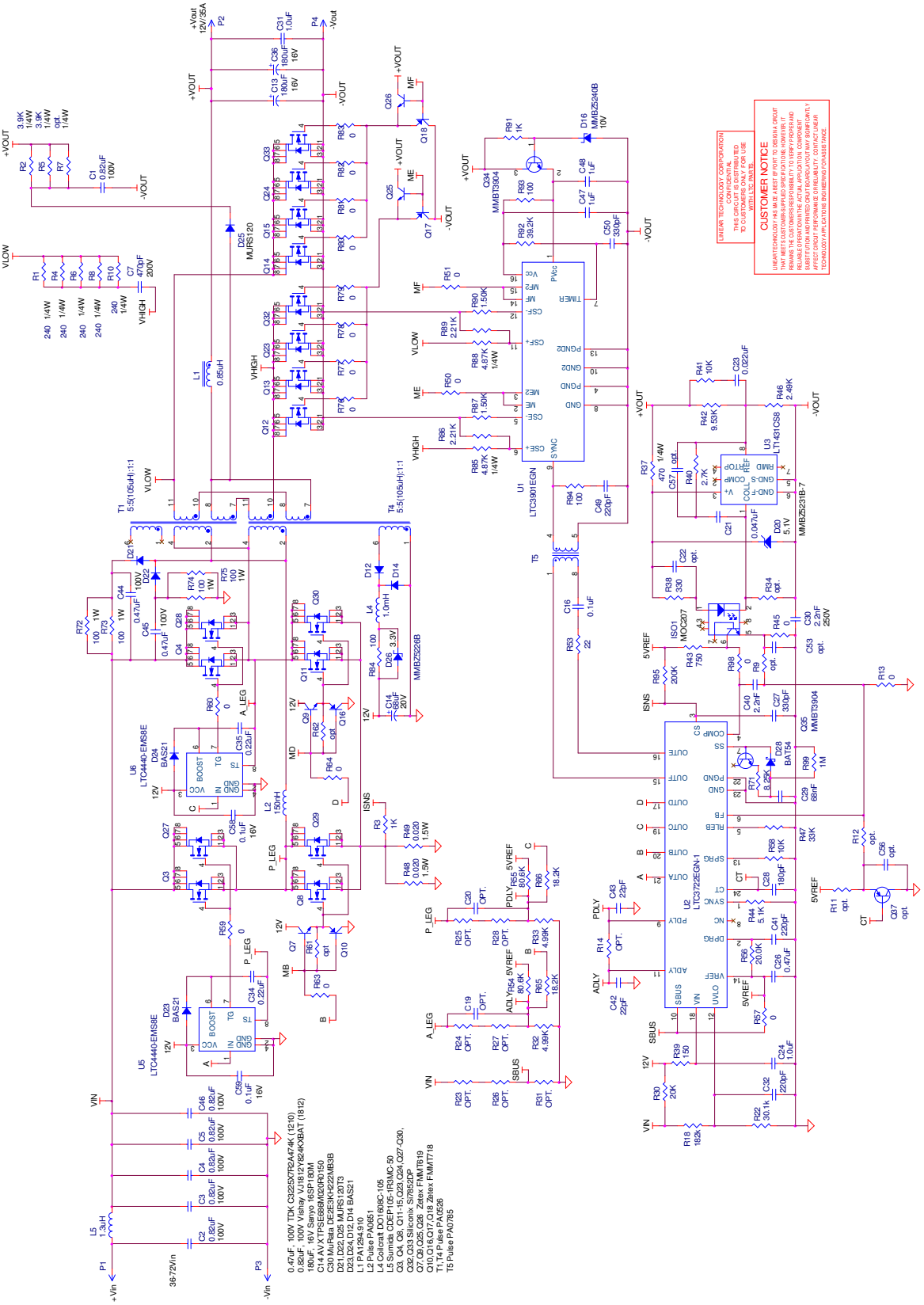

Figure 4. Schematic with Optional Components